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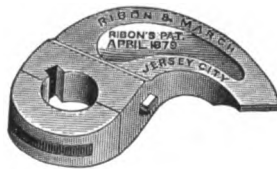
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MACHINERY,

MANUFACTURED BY

RIBON & MARCH,

JERSEY CITY, N. J., U. S. A.



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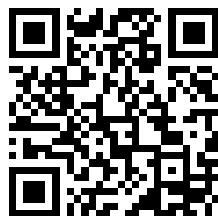
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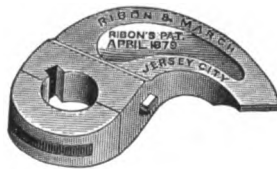
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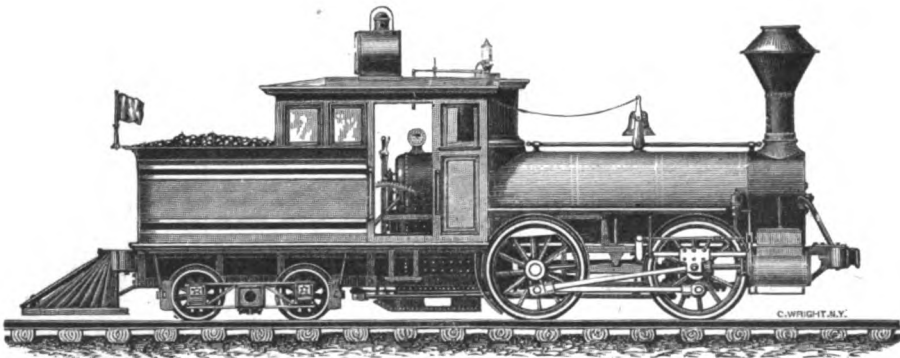
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ASTOR, LENOX AND
TILDEN FOUNDATIONS.
1902



LOCOMOTIVE FOR (2 FEET GAUGE) RAILROAD.

Scale, $\frac{1}{4}$ -in.=1 foot.

Weight, 23,750 lbs.

NEW YORK:
J. W. PRATT, BOOK AND JOB PRINTER, 73 to 79 FULTON STREET,
1881.

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PREFACE.

IN presenting our Catalogue and Price List to the public we have endeavored to issue one as complete as possible in every detail, and we trust that Planters, Builders, Contractors, Quarrymen, Mill Superintendents, Master Mechanics, and others, will find it to contain an exhaustive list and description of articles likely to be required in our special line of trade and manufacture. We also offer staple articles, not manufactured by us, in constant demand by the trade we represent; only such articles as possess the merit of utility, durability and superiority in every particular are included, and we have so arranged with the manufacturers represented that we can supply our customers at the lowest figures. Whatever may be needed, not herein described, we shall always be ready to give full information about, and to quote manufacturers' rates.

The prices we give will be found to be as low for first-class work and good material as those of any other manufacturer in the country, and though our rates are subject to the fluctuation in values of material used, the value of workmanship will be likely to remain about the same, so that no great variations need be feared by our patrons.

Our patterns are of modern style and make, and though our stock is extensive and varied, it is continually being added to, as new and improved designs are required. We make the different portions of our machines with a view to beauty, strength, and durability, with a minimum of material; this obviates much

dead weight, a fault common with the old style of manufactures.

We are now prepared to take contracts to manufacture, set up and start every description of machinery for mining, milling, quarrying, manufacturing, or other purposes; and to furnish estimates, specifications, plans, drawings and advice, only charging a nominal fee where extra clerk hire and draughtsman's services are required on new work.

We shall continue to extend our work shops and to increase our manufacturing facilities to meet our constantly augmenting trade, with promptness.

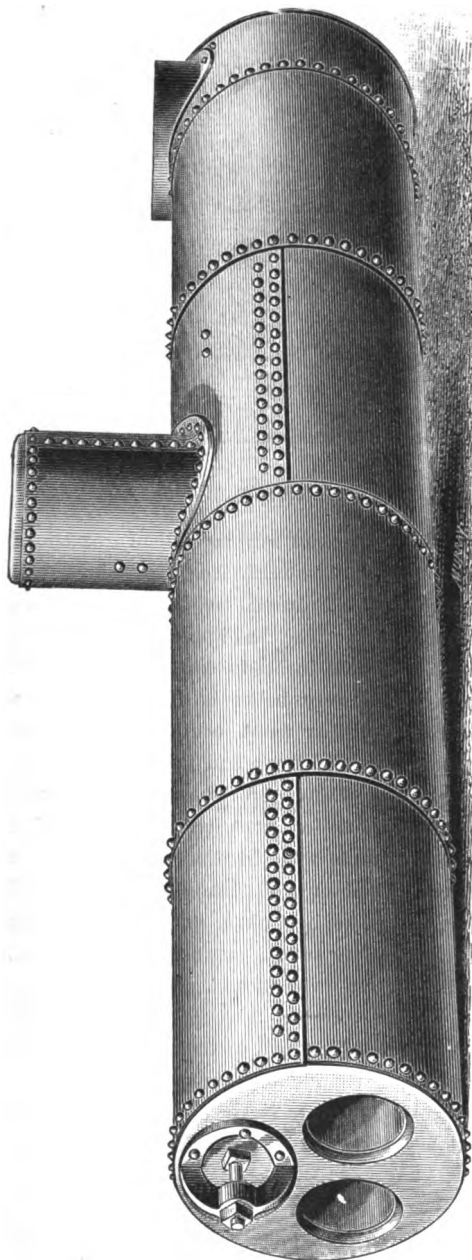
Our constant attention will be directed to any possible improvements in the machinery we make, or in the methods of its manufacture.

For the past ten years Mr. Ribon has been engaged in connection with other mechanical work, in the manufacture of mining machinery; while Mr. March has had thirty years' direction and superintendence of mining and milling works; we, therefore, anticipate that our combined practical knowledge and experience will enable us to supply our customers with the most improved machinery of the best material and workmanship.

In conclusion we beg to return our thanks for the kind patronage heretofore extended to Mr. Juan G. Ribon, and to beg the continuance of the same to the present firm of

RIBON & MARCH.

Horizontal Two Flue Boiler.

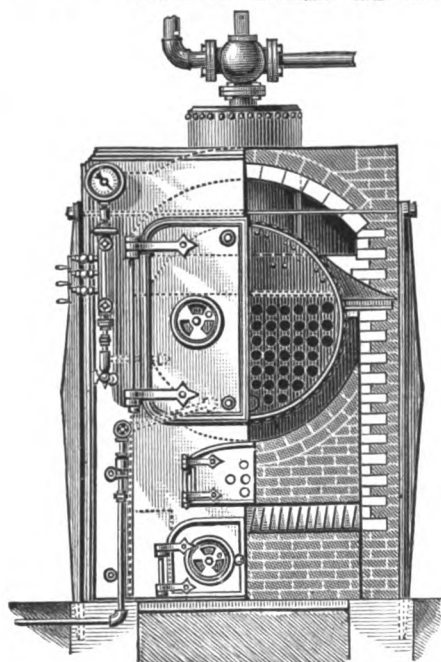
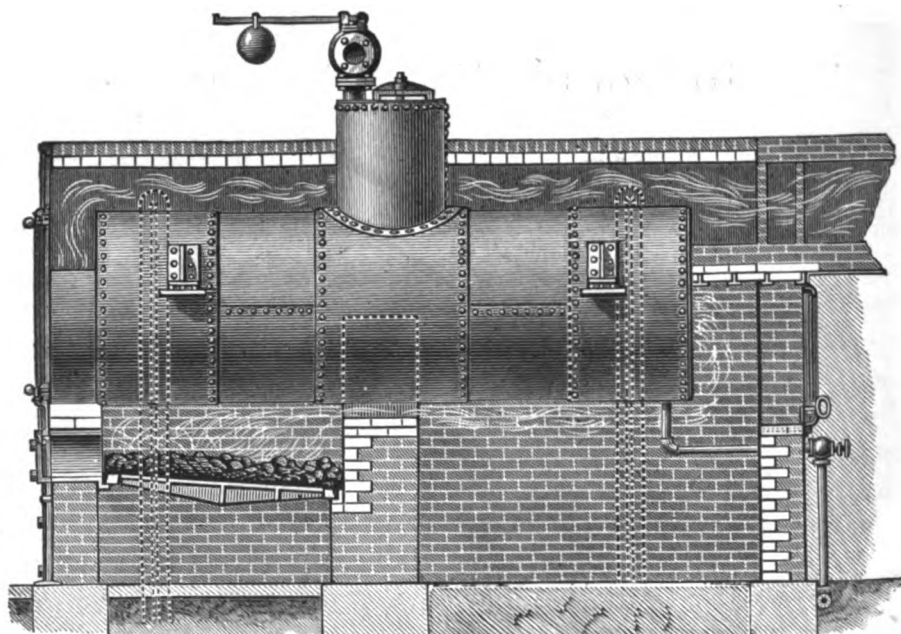


THESE Boilers are extensively used in the West Indies and South America, their principal advantage being the ease with which they are cleaned. They are made of the best charcoal hammered iron, and the longitudinal seams are all double riveted. Every boiler is thoroughly tested before leaving the factory. Boiler fixtures include arch front, with furnace door, grate bars, grate bearers, ash pit door, and frame for arch at rear of boiler; safety valve, steam gauge, water gauge, try cocks, whistle and pipe, blow-off valve, check valve, stop valve and smoke stack.

We will make to order any size required besides those given in the schedule of dimensions and prices given below; prices to include the necessary fittings before mentioned, unless otherwise ordered.

| | | | | | | |
|------------------|-------|-------|-------|---------|---------|---------|
| Horse Power... | 10 | 15 | 20 | 25 | 30 | 35 |
| <i>Shell.</i> | | | | | | |
| Diameter, inches | 36 | 40 | 42 | 42 | 48 | 48 |
| Length, feet.... | 18 | 18 | 20 | 25 | 25 | 30 |
| <i>Flues.</i> | | | | | | |
| Number | 2 | 2 | 2 | 2 | 2 | 2 |
| Diameter, inches | 11 | 12 | 13 | 13 | 16 | 16 |
| <i>Dome.</i> | | | | | | |
| Diameter, inches | 19 | 22 | 22 | 22 | 26 | 26 |
| <i>Price.</i> | | | | | | |
| Complete | \$600 | \$775 | \$975 | \$1,100 | \$1,275 | \$1,375 |

Horizontal Tubular Boilers.

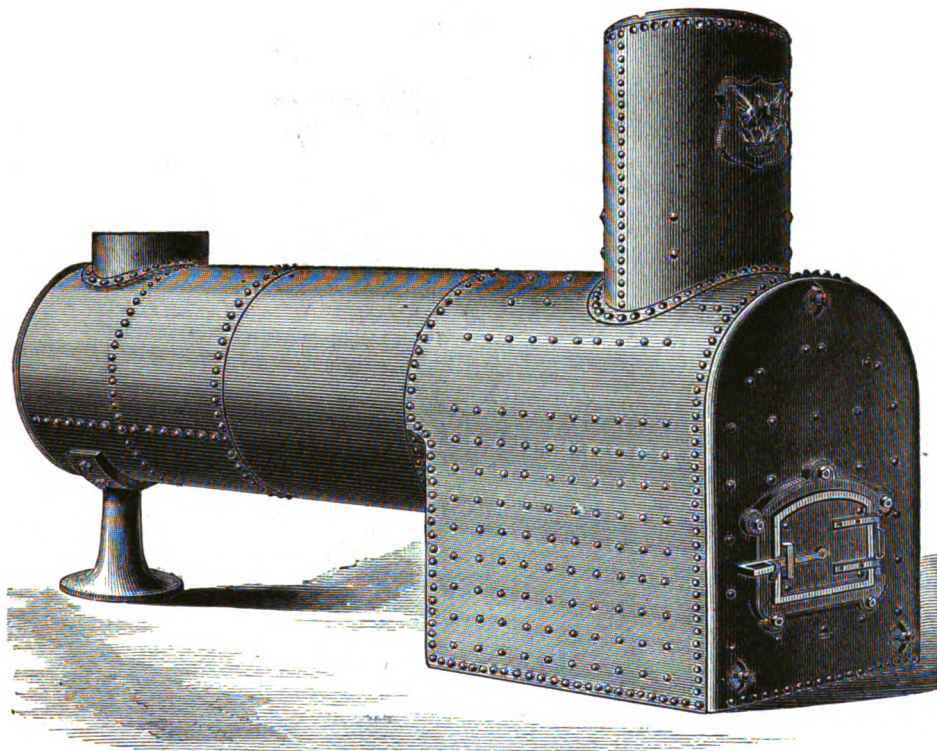


OUR Horizontal Tubular Boilers are made of the very best material, thoroughly stayed and subjected to hydraulic test of 150 lbs. to the square inch. The longitudinal seams of all sizes, over 36 inches in diameter, are double riveted. Every boiler is furnished with a heavy cast iron front, containing two large doors opposite front end of boiler, furnace door with lining, and two ash pit doors; also anchor bolts for front, grate bars, grate bar bearers, plate with friction rollers for boiler lugs, flue door and frame, binder bars and bolts, smoke box plate, safety valve, steam gauge, water gauge, gauge cocks, feed valve, check valve, blow-off cock and smoke stack.

In the annexed table of dimensions the prices of boilers include the necessary mountings and fittings above mentioned. We are prepared to make larger sizes to order of this or any other pattern required.

| | | | | | | | | |
|-----------------------------|-------|-------|-------|-------|-------|---------|---------|---------|
| Horse Power..... | 10 | 5 | 20 | 25 | 30 | 40 | 50 | 60 |
| Shell—Diameter, inches..... | 28 | 32 | 36 | 36 | 40 | 42 | 48 | 54 |
| Length, feet..... | 29½ | 10 | 12 | 15 | 15 | 16 | 17 | 17 |
| Tubes—Number..... | 20 | 28 | 26 | 26 | 22 | 40 | 48 | 48 |
| Diameter, inches..... | 2½ | 2½ | 3 | 3 | 3 | 3 | 3 | 3½ |
| Dome—Diameter, inches..... | 19 | 22 | 22 | 22 | 26 | 26 | 26 | 30 |
| Price, complete..... | \$450 | \$575 | \$700 | \$825 | \$950 | \$1,100 | \$1,400 | \$1,700 |

Locomotive Boiler.



THE Locomotive Boiler is particularly useful in locations where it is not convenient or practicable to build a brick furnace, as it is complete in itself and can be put in operation as soon as located.

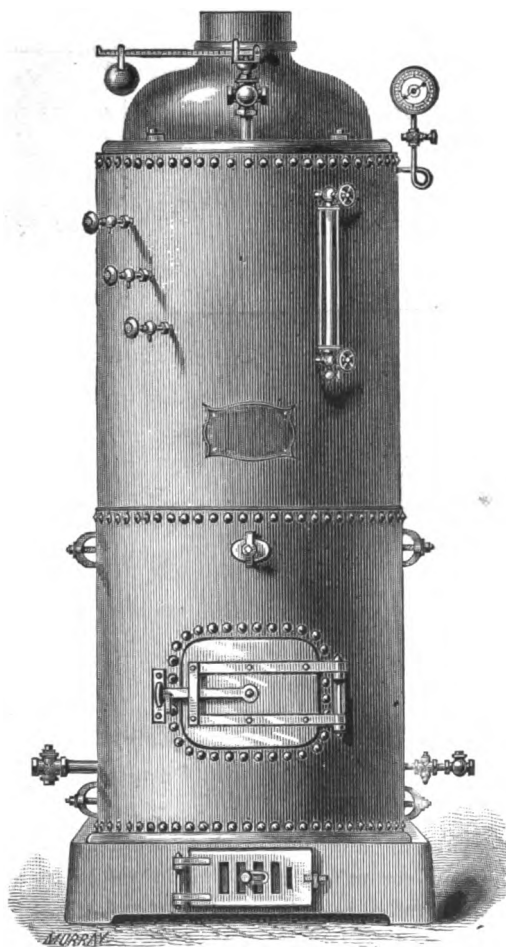
The longitudinal seams are all double riveted; the boiler is properly stayed and braced; the crown sheet is made of Wawasset fire box iron, and the tubes are the best boiler

tubes manufactured. We are prepared to furnish these boilers according to table of dimensions and prices given below, the necessary fittings, such as grate bars, safety valves, gauge cocks, pressure gauges, glass water gauges, blow off cocks and check valves, being included in the estimates. Larger sizes can be made to order at short notice of any horse power required.

SCHEDULE OF DIMENSIONS AND PRICES.

| | | | | | | | | | | | |
|-------------------|-----|-----|-----|-----|-------|-------|-------|-------|-------|-------|---------|
| Horse Power | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 50 | 60 | |
| <i>Boiler.</i> | | | | | | | | | | | |
| Diameter..... | 24 | 33 | 36 | 36 | 42 | 42 | 48 | 48 | 54 | 54 | Inch. |
| <i>Fire Box.</i> | | | | | | | | | | | |
| Length..... | 36 | 40 | 41 | 43 | 48 | 49 | 49 | 54 | 60 | 72 | Inch. |
| Width..... | 30 | 29 | 31 | 31 | 37 | 37 | 42 | 42 | 49 | 49 | Inch. |
| Height..... | 24 | 33 | 36 | 36 | 42 | 42 | 42 | 42 | 46 | 46 | Inch. |
| <i>Tubes.</i> | | | | | | | | | | | |
| Number..... | 24 | 32 | 34 | 34 | 46 | 46 | 46 | 50 | 62 | 76 | |
| Diameter..... | 2 | 2½ | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | Inch. |
| Length..... | 6 | 6 | 7 | 9½ | 9 | 9 | 9 | 12½ | 13 | 13 | Feet. |
| <i>Price.</i> | | | | | | | | | | | |
| Complete | 425 | 550 | 750 | 950 | 1,125 | 1,250 | 1,475 | 1,600 | 1,800 | 2,025 | \$ cts. |

Upright Tubular Boiler.

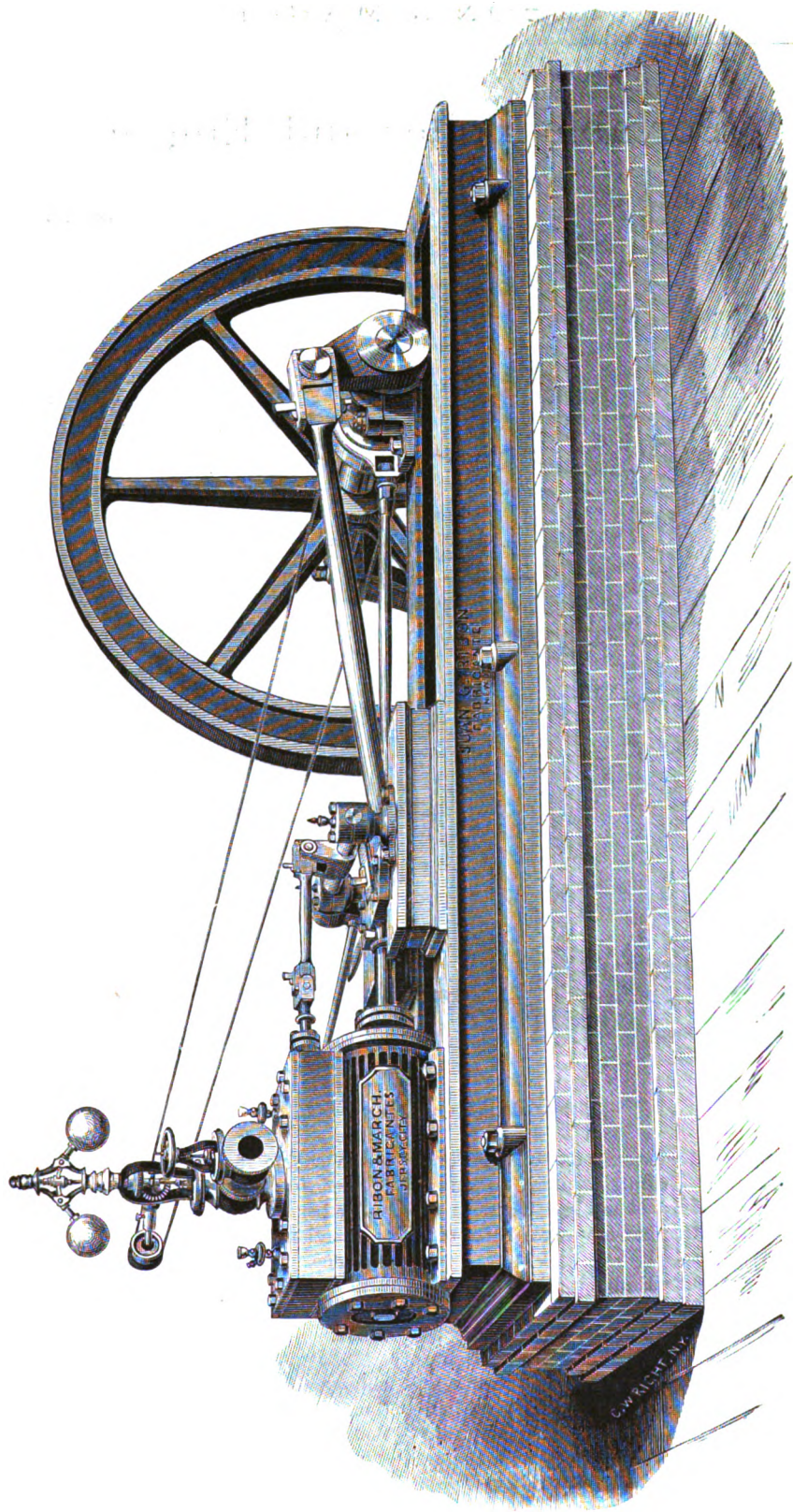


Our Upright Tubular Boilers are made of the very best material and subjected to a hydraulic test of 150 lbs. to the square inch. The vertical seams of all sizes larger than 36 inches in diameter are double riveted. All boilers are furnished with our new style of base, making them safe and secure, and also with a fire grate, safety valve, steam gauge,

water gauge, try cocks, feed valve, check valve and blow-off cock.

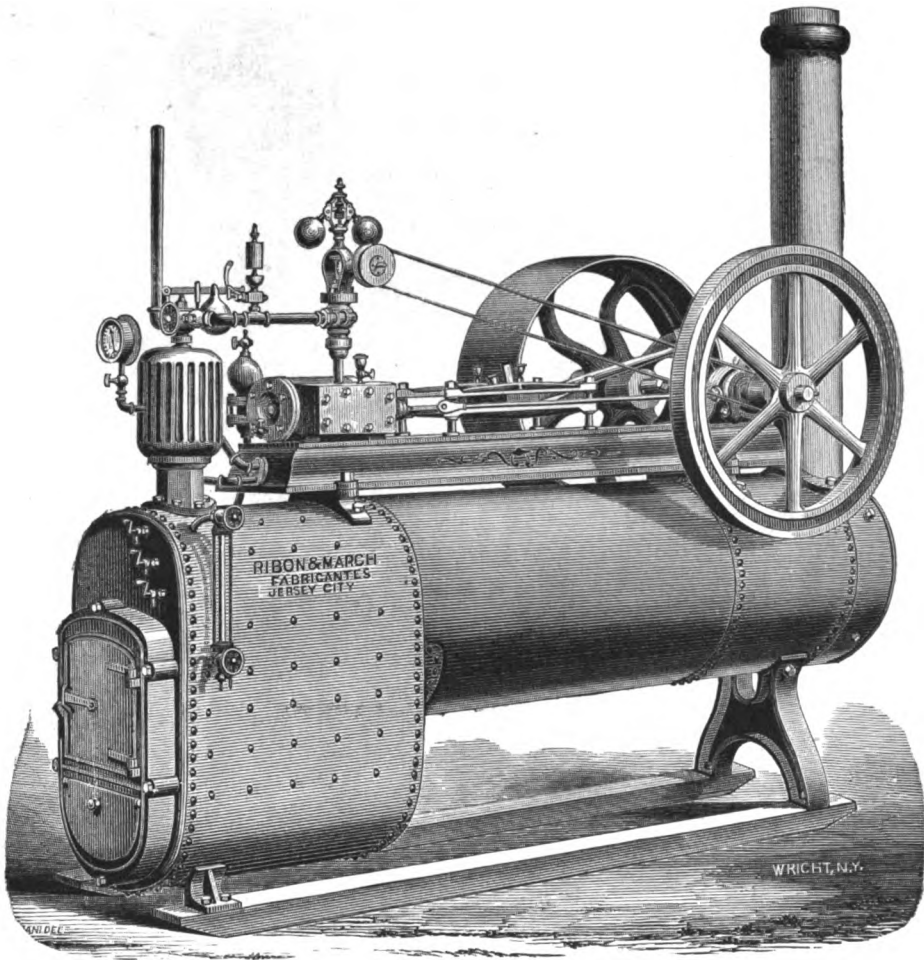
In the accompanying schedule of sizes the prices include the mountings and necessary fittings above described, but we will furnish boilers of any size with or without fittings as ordered and of any design required.

| | | | | | | | | | | | |
|------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------|
| Horse Power..... | 4 | 5 | 7 | 10 | 12 | 15 | 20 | 25 | 30 | 35 | |
| <i>Boiler.</i> | | | | | | | | | | | |
| Diameter..... | 24 | 30 | 30 | 32 | 35 | 36 | 42 | 48 | 54 | 56 | Inches. |
| Height..... | 5 | 5 | 6 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | Feet. |
| <i>Furnace.</i> | | | | | | | | | | | |
| Diameter..... | 21 | 26 | 26 | 28 | 31 | 32 | 37 | 42 | 48 | 50 | Inches. |
| Height..... | 24 | 27 | 28 | 30 | 27 | 30 | 30 | 30 | 30 | 30 | Inches. |
| <i>Tubes.</i> | | | | | | | | | | | |
| Number..... | 19 | 43 | 47 | 42 | 55 | 59 | 70 | 88 | 104 | 120 | |
| Diameter..... | 2 | 2 | 2 | 2 1/4 | 2 1/4 | 2 1/4 | 2 1/4 | 2 1/4 | 2 1/4 | 2 1/4 | Inches. |
| Length..... | 3 | 3 | 3 3/4 | 4 1/2 | 4 3/4 | 5 1/2 | 5 1/2 | 5 1/2 | 6 1/2 | 6 1/2 | Inches. |
| <i>Price.</i> | | | | | | | | | | | |
| Complete..... | \$200.00 | \$240.00 | \$300.00 | \$375.00 | \$450.00 | \$500.00 | \$575.00 | \$700.00 | \$825.00 | \$950.00 | \$ cts. |



Horizontal Stationary Engine, Manufactured by Ribon & March, Jersey City, U. S. A.

Portable Boiler and Engine.



Mounted on Skids.

THE above cut represents one of our Portable Boilers and Engines mounted on skids. They are constructed of any size from five to twenty horse power, but any special size can be made to order.

The illustration will give a fair idea of the general appearance of these boilers; it will only be necessary for us to add that they are made of the best material and that the workmanship is accurate—all working parts highly finished.

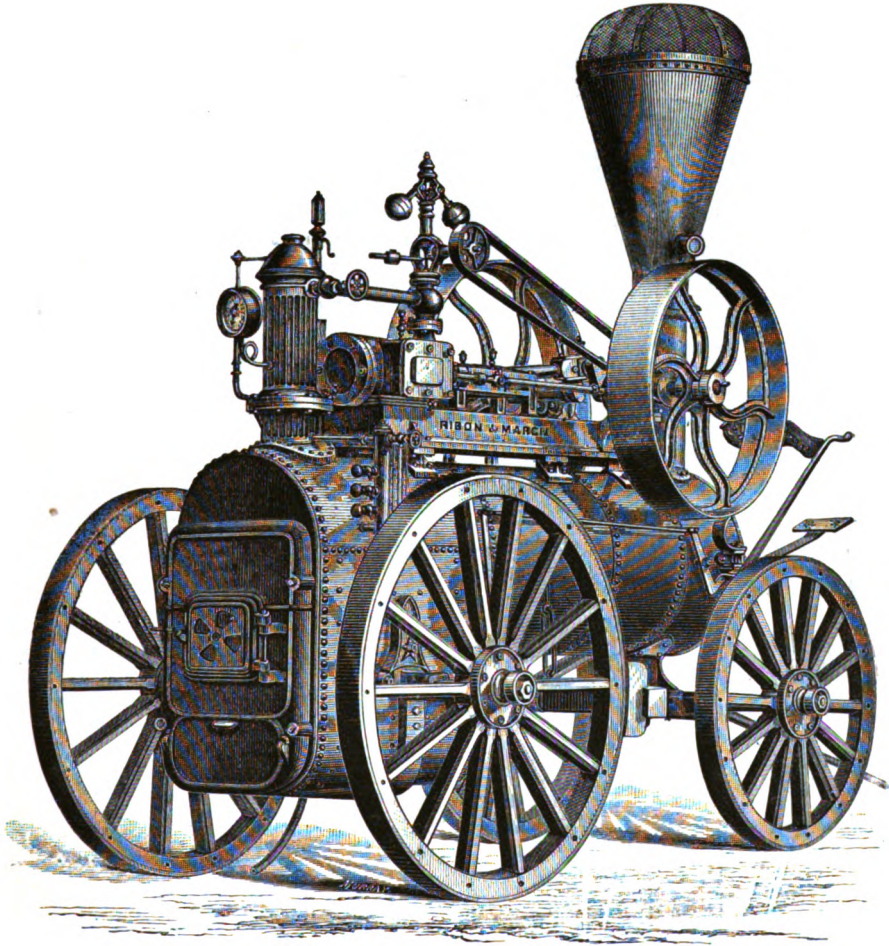
The various parts of the boiler, steam and exhaust passages and other vital parts, are carefully proportioned to accord with dimensions shown to be required by the use of the

steam engine indicator. These engines can be used for running saw mills, brick machines, and other work where an occasional change in location of operations is necessary. This machine, and the one described on the next page, is especially useful for surface mining as well as for use on the sugar plantation.

The engine may be detached from the boiler and separately mounted on brick work foundation, making a convenient and complete stationary engine.

They are fully tested with steam and hydraulic pressure before leaving the shop.

Portable Boiler and Engine.



Mounted on Wheels.

THESE Engines are constructed with very strong truck or running gear, with wood or iron wheels as may be preferred, the bolster being placed under the end remote from the furnace, so that the bulk of the weight is placed upon the hind wheels of the truck, the axles of which are made from the very best refined hammered iron, and curved the exact shape of the boiler at the fire box-end, which gives an equal bearing to the parts attached. This not only gives extra strength but prevents any local strain on the bearings of the axle boxes. Brackets are bolted to the boiler to abut on the shoulders of the axles, thus firmly bracing them against severe or sudden strains and shocks.

The Salter Spring Balance is used on the safety valve instead of a weight.

The smoke stack is hinged and provided with a spark arrester.

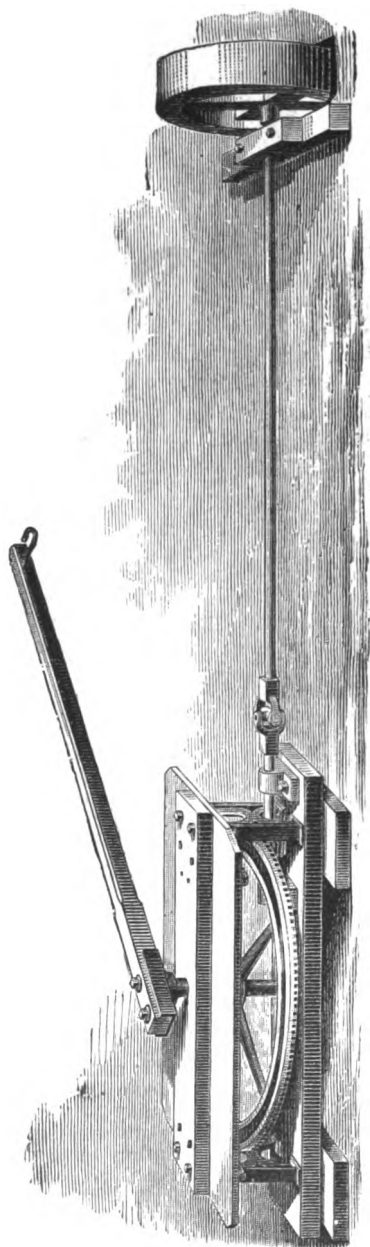
The suction pipe is flexible and non-collapsible, and is provided with rose strainer.

There is an extra feed pump to supply the boiler while at rest, to be worked by hand.

The portable qualities of the engine include, besides the truck before described, a comfortable seat for the driver, a pole for two horses, and a reliable brake on the rear wheels, operated by a foot lever under the seat.

In fact, nothing has been omitted in the construction of these machines that is useful and efficient in developing them as the best and most complete "mounted engine" now in the market.

We build eleven sizes from five to forty horse power.



Horse Power.

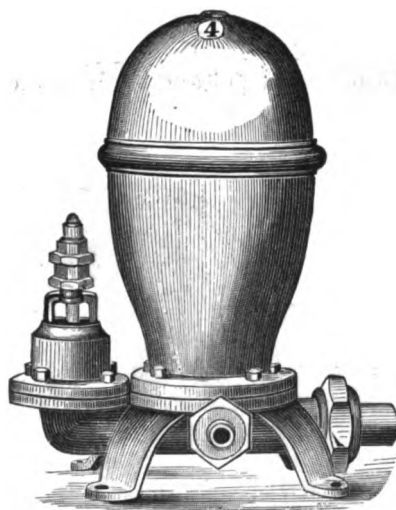
WE illustrate a Light Horse Gear made for driving stamping mills, sugar mills, rubber presses, grinding mills, pumping water, etc., sawing wood, hoisting purposes, etc.

From one to eight horses may be worked, as four arms can be attached to work one or two horses each.

Where more than four horses are to be habitually used it will be found to be much more economical to use steam power.

The horse power illustrated here, with
 single gear, shaft and pulley.....\$ 50.00
 With four arms and double gear for in-
 crease of speed, shaft and pulley.. 100.00

The Hydraulic Ram.



WHEREVER the supply of water is plentiful and an adequate fall can be secured, the Hydraulic Ram is the cheapest and simplest arrangement for raising water that can be used. It operates by simple inertia, the water acquiring a certain momentum in its fall is suddenly checked and diverted up the discharge pipe; when this motion ceases the exhaust valve again opens and the above operation is repeated. No other power is required, and the ram, having no moving parts, except the valves, requires but little attention to keep it in running order.

From the same quantity of water and fall a large proportion may be forced up a short distance, or a smaller quantity a greater height. A fall of ten feet from the brook or spring to

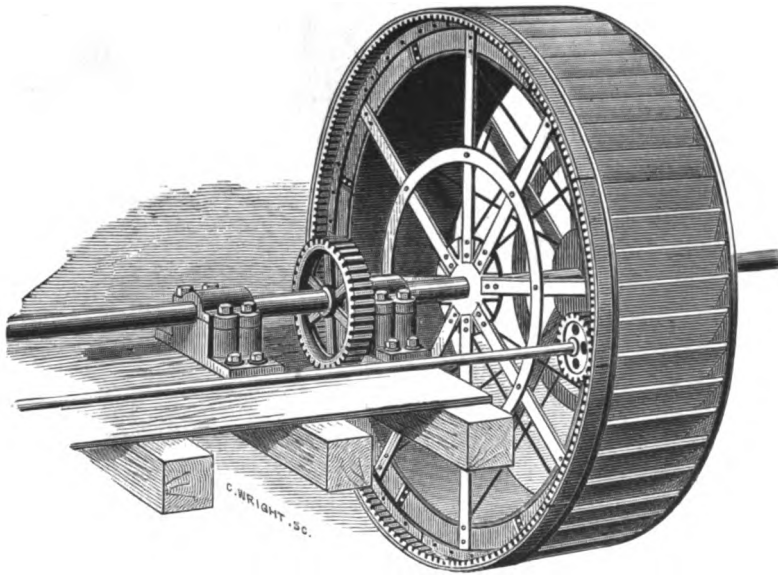
the ram is amply sufficient to raise water 150 feet above the location of the machine.

Turns and elbows in either the drive or discharge pipes should be avoided; but there should be from 25 to 50 feet of discharge pipe, even with a fall of but a few feet to secure the quantity and velocity of water to work the ram properly. Where room is limited a coil of 5 or 6 feet in diameter should be put in, making the bends as easy as possible, as the slightest obstruction in the flow of the water materially interferes with the effective working of the ram.

To find the number of gallons raised per minute, multiply sixty-five times the quantity received by the number of feet in fall, and divide by one hundred times the height water is to be elevated.

| Size Number..... | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------------------------|--------------------|---------------|----------------|---------|----------------|---------|----------------|----------------|
| <i>Drive or Fall.</i> | | | | | | | | |
| Length, feet..... | 25 : 40 | 25 : 40 | 25 : 40 | 25 : 40 | 30 : 50 | 30 : 50 | 30 : 50 | 30 : 50 |
| Diameter, inches..... | $\frac{3}{4}$ | 1 | $1\frac{1}{4}$ | 2 | $2\frac{1}{2}$ | 4 | 6 | 9 |
| <i>Discharge.</i> | | | | | | | | |
| Diameter, inches..... | $\frac{3}{4}$ | $\frac{3}{4}$ | $\frac{1}{2}$ | 1 | $1\frac{1}{4}$ | 2 | $2\frac{1}{2}$ | $3\frac{1}{2}$ |
| <i>Water Received.</i> | | | | | | | | |
| Gallons, per Minute..... | $1\frac{1}{2} : 2$ | 1 : 4 | 2 : 8 | 3 : 14 | 4 : 25 | 8 : 60 | 12 : 120 | 30 : 250 |
| Price..... | \$9.00 | \$11.00 | \$14.00 | \$22.00 | \$40.00 | \$75.00 | \$125.00 | \$225.00 |

Iron Water Wheel.



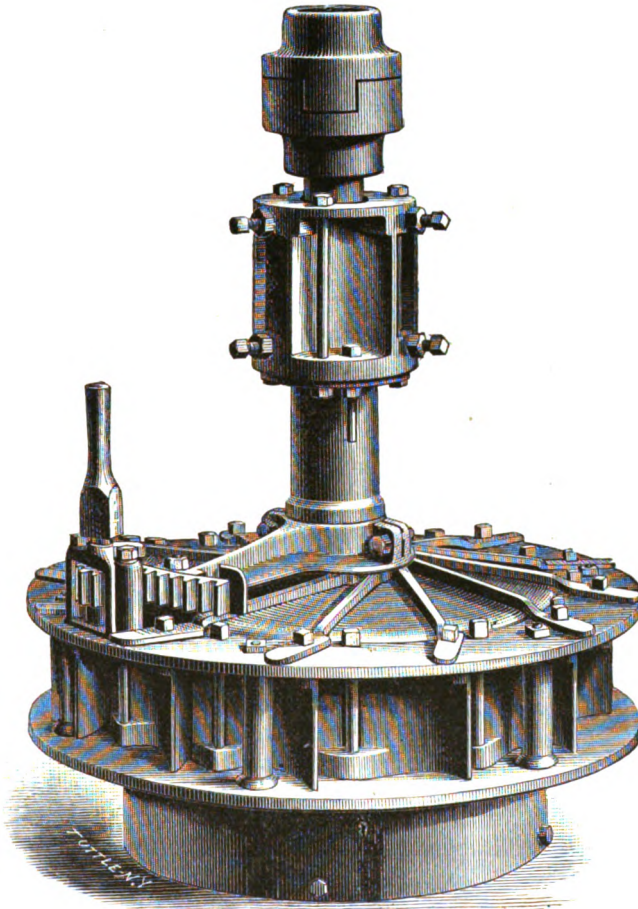
THE above cut illustrates one of our Water Wheels constructed entirely of cast and wrought iron. They are made in sections, the largest piece not weighing over five, six or seven hundred pounds, according to size of wheel; this facilitates transportation, and when the sections are bolted together they form strong, firm and durable wheels.

The illustration shows an annular gear on the periphery of the Water Wheel, and also a

gear wheel on the main shaft for slow motion; but we often construct spur gearing on the periphery when so ordered by our customers.

They are suitable for overshot, breast or undershot water wheels, and parties ordering the same will please state head and quantity of water available. Detail working drawing will be sent with wheels giving particulars of construction for foundations and connections.

The Leffel Turbine Water Wheel.



ONE of the first advantages to be realized in the use of the Turbine is the economy of space and of the cost of setting up. An over-shot wheel requires much room, not only for the wheel itself, but for the shaft and bevel gear, and the bearings for the wheel shaft must be constructed of heavy stone masonry and large iron journals. The turbine wheel can be placed at the lowest ordinary level of tail water. The Turbine shaft is vertical and can be run up any number of stories, pulleys and belts being put wherever required, and mill-stones, pumps, or other machinery, being directly connected with this shaft. Where a horizontal shaft is preferred, bevel gearing may be located immediately over the Turbine, and positive motion obtained if belts are objectionable. This is also the best arrangement where

it is desired to carry the power any distance by means of shafting,

In ordering wheels, state whether a right or left revolution is required, and draw a curved arrow to show which way Turbine is to work.

The six smallest sizes are made of brass, from $7\frac{1}{2}$ to $13\frac{1}{2}$ inches, inclusive, in diameter. The prices of which are relatively higher than the larger sizes made of steel.

To find the size of machine required, from the following table, follow column of head of water obtainable down to square giving cubic feet per minute, with which will be found horse power available and number of revolutions per minute of turbine wheel. On the same line in left hand column will be found the size of machine required, while extreme right hand columns will give weight and price.

The Leffel Turbine Water Wheel.

SIZES, WEIGHTS AND PRICES OF TURBINES, WITH HORSE POWER, CUBIC FEET OF WATER CONSUMED, AND NUMBER OF REVOLUTIONS PER MINUTE, FOR VARIOUS FALLS OR HEADS OF WATER, FROM THREE TO FORTY FEET.

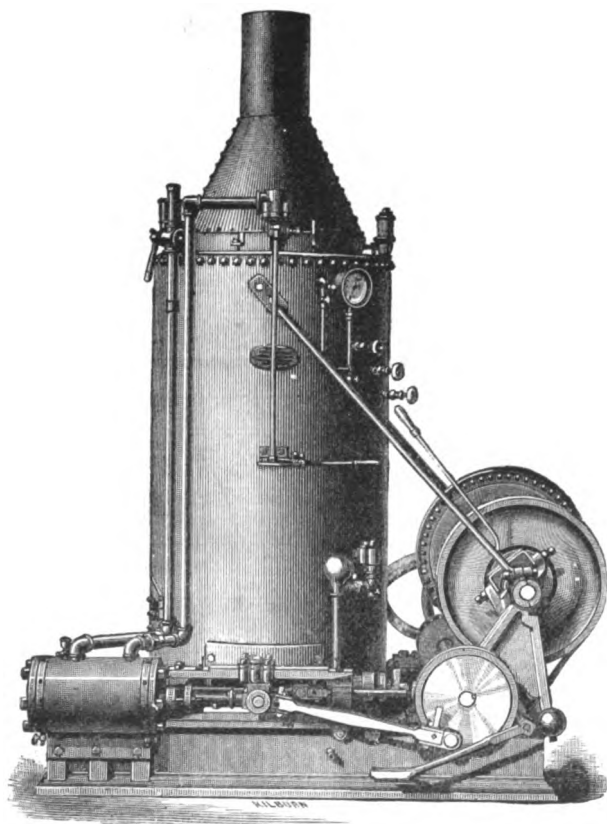
| Diameter of Wheel in Inches. | Horse Power. Cubic Feet. Revolutions per Minute. | 3 | 4 | 5 | 6 | 8 | 10 | 12 | 14 |
|------------------------------|--|---------------------|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|----------------------|
| 7½ No. 1. | Horse Power. Cubic Feet. Revolutions. | .15 29 813 | .22 33 860 | .31 37 404 | .41 41 444 | .63 47 511 | .89 53 572 | 1.17 58 627 | 1.47 68 677 |
| 7½ No. 1. | Horse Power. Cubic Feet. Revolutions. | .20 39 813 | .30 45 860 | .42 50 404 | .56 55 444 | .86 64 511 | 1.20 71 572 | 1.57 78 627 | 1.98 84 677 |
| 10 No. 1. | Horse Power. Cubic Feet. Revolutions. | .25 49 239 | .38 57 275 | .53 64 306 | .70 70 337 | 1.08 80 390 | 1.51 90 436 | 1.98 98 478 | 2.50 106 516 |
| 10 No. 1. | Horse Power. Cubic Feet. Revolutions. | .33 67 239 | .52 77 275 | .72 86 306 | .95 94 337 | 1.46 109 390 | 2.04 122 436 | 2.65 133 478 | 3.38 144 516 |
| 13½ No. 1. | Horse Power. Cubic Feet. Revolutions. | .44 87 180 | .67 100 208 | .94 112 233 | 1.24 123 255 | 1.90 142 304 | 2.66 159 329 | 3.50 174 360 | 4.41 188 396 |
| 13½ No. 1. | Horse Power. Cubic Feet. Revolutions. | .58 116 180 | .90 134 208 | 1.25 149 233 | 1.65 164 255 | 2.54 189 294 | 3.55 211 329 | 4.66 232 360 | 5.88 250 399 |
| 15½ No. 1. | Horse Power. Cubic Feet. Revolutions. | .76 151 167 | 1.17 174 181 | 1.63 194 202 | 2.14 213 221 | 3.30 246 256 | 4.61 275 296 | 6.06 301 313 | 7.64 325 338 |
| 17½ No. 1. | Horse Power. Cubic Feet. Revolutions. | .97 197 136 | 1.53 227 158 | 2.13 254 176 | 2.80 278 193 | 4.31 321 223 | 6.08 359 249 | 7.93 393 273 | 9.99 425 296 |
| 20 No. 1. | Horse Power. Cubic Feet. Revolutions. | 1.31 260 119 | 2.02 301 138 | 2.82 336 154 | 3.71 368 169 | 5.71 425 195 | 7.98 476 218 | 10.40 521 239 | 13.22 563 258 |
| 23 No. 1. | Horse Power. Cubic Feet. Revolutions. | 1.75 347 104 | 2.69 401 119 | 3.76 448 134 | 4.94 491 147 | 7.61 567 169 | 10.64 634 190 | 13.99 695 208 | 17.63 750 224 |
| 26½ No. 1. | Horse Power. Cubic Feet. Revolutions. | 2.27 451 90 | 3.50 521 104 | 4.89 583 116 | 6.43 638 127 | 9.90 737 147 | 13.83 824 164 | 18.18 903 180 | 22.92 975 195 |
| 30½ No. 1. | Horse Power. Cubic Feet. Revolutions. | 3.03 602 78 | 4.67 695 90 | 6.52 777 101 | 8.57 861 111 | 13.20 983 128 | 18.44 1099 143 | 24.24 1204 157 | 30.56 1300 169 |
| 35 No. 1. | Horse Power. Cubic Feet. Revolutions. | 3.99 738 68 | 6.15 916 79 | 8.59 1023 88 | 11.29 1295 96 | 17.38 1448 111 | 24.30 1546 125 | 31.94 1586 136 | 40.25 1713 148 |
| 40 No. 1. | Horse Power. Cubic Feet. Revolutions. | 5.25 1042 60 | 8.06 1203 69 | 11.28 1345 77 | 14.88 1473 84 | 22.84 1701 97 | 31.92 1902 109 | 41.96 2083 119 | 52.88 2251 129 |
| 44 No. 1. | Horse Power. Cubic Feet. Revolutions. | 5.9 1213 55 | 9.4 1400 63 | 13.1 1568 70 | 17.2 1717 77 | 26.6 1978 89 | 37.2 2211 100 | 49.3 2426 109 | 61.6 2622 118 |
| 48 No. 1. | Horse Power. Cubic Feet. Revolutions. | 7.58 1505 50 | 11.66 1738 57 | 16.30 1942 64 | 21.42 2128 70 | 32.99 2457 81 | 46.11 2747 91 | 60.61 3009 99 | 76.39 3251 107 |
| 52 No. 1. | Horse Power. Cubic Feet. Revolutions. | 9.85 1856 44 | 15.16 2259 53 | 21.19 2525 60 | 27.85 2766 66 | 42.89 3194 76 | 59.94 3571 86 | 78.79 3912 94 | 99.81 4226 102 |
| 56 No. 1. | Horse Power. Cubic Feet. Revolutions. | 10.40 2045 42 | 15.82 2345 49 | 22.12 2619 55 | 29.06 2870 60 | 44.75 3315 69 | 62.54 3717 78 | 82.20 4060 85 | 103.60 4385 92 |
| 56 No. 2. | Horse Power. Cubic Feet. Revolutions. | 13.10 2556 42 | 19.77 2931 40 | 27.65 3273 55 | 36.32 3587 60 | 55.98 4143 69 | 78.17 4646 78 | 102.75 5075 85 | 129.50 5481 92 |
| 61 No. 1. | Horse Power. Cubic Feet. Revolutions. | 15.16 3010 40 | 23.32 3476 45 | 32.60 3884 50 | 42.64 4256 55 | 65.98 4914 64 | 92.22 5494 71 | 121.22 6018 78 | 152.78 6502 84 |
| 66 No. 1. | Horse Power. Cubic Feet. Revolutions. | 15.37 3000 35 | 23.64 3464 40 | 33.03 3872 45 | 43.43 4242 50 | 66.00 4898 57 | 93.00 5477 64 | 122.00 6000 70 | 154.00 6482 76 |
| 66 No. 2. | Horse Power. Cubic Feet. Revolutions. | 19.21 3750 35 | 29.55 4330 40 | 41.28 4840 45 | 54.28 5302 50 | 81.00 6123 57 | 116.00 6847 64 | 152.00 7500 70 | 192.00 8102 76 |

The Leffel Turbine Water Wheel.

SIZES, WEIGHTS AND PRICES OF TURBINES, WITH HORSE POWER, CUBIC FEET OF WATER CONSUMED, AND NUMBER OF REVOLUTIONS PER MINUTE, FOR VARIOUS FALLS OR HEADS OF WATER, FROM THREE TO FORTY FEET.

| 16 | 18 | 21 | 24 | 27 | 30 | 33 | 36 | 40 | WEIGHT. Pounds. | PRICE. |
|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------------|----------|
| 1.79 67 728 | 2.14 71 767 | 2.70 77 828 | 3.30 82 886 | 3.98 87 939 | 4.61 92 990 | 5.22 96 1039 | 6.08 100 1085 | 7.00 106 1148 | .... | \$180.00 |
| 2.42 90 728 | 2.89 96 767 | 3.64 108 828 | 4.45 111 886 | 5.31 117 939 | 6.22 124 990 | 7.18 130 1039 | 8.18 136 1085 | 9.58 148 1148 | .... | 185.00 |
| 3.05 114 551 | 3.64 121 585 | 4.59 130 632 | 5.60 139 675 | 6.69 145 716 | 7.83 156 755 | 9.04 163 792 | 10.30 171 827 | 12.06 180 872 | 92 | 190.00 |
| 4.18 154 551 | 4.98 163 585 | 6.21 176 632 | 7.58 188 675 | 9.05 200 716 | 10.60 211 755 | 12.28 221 792 | 13.98 231 827 | 16.33 243 872 | 105 | 195.00 |
| 5.38 201 416 | 6.43 213 441 | 8.10 230 477 | 9.89 246 510 | 11.80 260 540 | 13.82 275 570 | 15.95 288 598 | 18.17 301 624 | 21.28 317 658 | 175 | 200.00 |
| 7.18 267 416 | 8.57 284 441 | 10.79 306 477 | 13.19 327 510 | 15.74 347 540 | 18.43 366 570 | 21.26 384 598 | 24.23 401 624 | 28.37 423 658 | 195 | 210.00 |
| 9.33 345 551 | 11.14 369 585 | 14.08 398 632 | 17.14 426 675 | 20.46 451 716 | 23.96 476 755 | 27.64 499 792 | 31.50 521 827 | 36.89 550 872 | 280 | 185.00 |
| 12.30 455 515 | 14.56 482 584 | 18.35 521 581 | 22.42 557 586 | 26.75 590 609 | 31.38 622 631 | 36.15 653 658 | 41.19 682 678 | 48.24 719 698 | 362 | 195.00 |
| 16.15 602 276 | 19.28 638 293 | 24.29 689 316 | 29.67 737 338 | 35.41 781 358 | 41.47 824 378 | 47.84 864 396 | 54.51 902 414 | 63.84 951 436 | 598 | 205.00 |
| 21.54 802 240 | 25.70 851 254 | 32.88 919 275 | 39.56 982 294 | 47.21 1042 311 | 55.30 1098 328 | 63.79 1152 344 | 72.68 1203 360 | 85.12 1268 379 | 704 | 225.00 |
| 28.00 1043 208 | 33.41 1106 220 | 42.10 1194 236 | 51.43 1277 255 | 61.37 1354 270 | 71.89 1428 285 | 82.93 1497 299 | 94.49 1564 312 | 110.66 1648 329 | 1196 | 265.00 |
| 37.33 1390 181 | 44.45 1475 192 | 56.13 1592 207 | 68.58 1708 221 | 81.82 1806 235 | 95.85 1904 248 | 110.57 1996 260 | 125.98 2085 271 | 147.53 2198 286 | 1510 | 300.00 |
| 49.17 1831 158 | 58.68 1943 167 | 73.94 2098 180 | 90.34 2243 193 | 107.78 2379 205 | 126.26 2508 216 | 145.65 2630 226 | 165.96 2747 236 | 194.36 2895 249 | 2277 | 335.00 |
| 64.61 2406 138 | 77.10 2552 146 | 97.14 2756 158 | 118.69 2947 169 | 141.62 3125 179 | 165.89 3295 189 | 191.87 3455 198 | 218.05 3609 207 | 255.37 3804 218 | 2976 | 385.00 |
| 75.3 2809 126 | 89.8 2977 134 | 115.5 3214 145 | 142.7 3545 155 | 170.3 3760 164 | 199.5 3964 173 | 230.1 4155 181 | 262.2 4341 189 | 307.1 4578 200 | 3700 | 425.00 |
| 98.32 3475 115 | 111.37 3687 122 | 140.32 3981 132 | 171.44 4266 141 | 204.56 4514 149 | 239.62 4759 157 | 276.42 4991 165 | 314.95 5213 172 | 368.87 5495 182 | 4462 | 500.00 |
| 121.32 4518 110 | 144.78 4793 115 | 182.42 5175 122 | 222.87 5533 131 | 265.93 5868 138 | 311.51 6187 145 | 359.35 6488 153 | 409.44 6777 160 | 479.63 7143 170 | 5510 | 620.00 |
| 136.59 4887 99 | 151.04 4976 104 | 190.31 5371 112 | 232.47 5742 121 | 277.48 6090 128 | 325.04 6420 135 | 375.31 6738 142 | 430.32 7055 149 | 508.75 7394 157 | 5998 | 700.00 |
| 158.28 5656 99 | 188.80 6220 104 | 237.88 6713 112 | 290.58 7175 121 | 346.85 7612 128 | 406.30 8025 135 | 469.16 8412 142 | 537.90 8818 149 | 629.68 9230 157 | 6192 | 720.00 |
| 186.64 6650 80 | 222.74 7374 96 | 280.64 7962 103 | 342.88 8512 110 | 408.12 9023 117 | 479.24 9518 124 | 552.84 9982 130 | 629.90 10426 136 | 737.74 10960 143 | 8115 | 815.00 |
| 199.00 6929 81 | 225.00 7350 86 | 284.00 7938 93 | 347.00 8476 99 | 414.00 9000 105 | 485.00 9488 111 | 560.00 9950 117 | 638.00 10394 122 | 747.00 10955 129 | 9382 | 900.00 |
| 226.00 8661 81 | 232.00 9188 86 | 285.00 9622 93 | 433.00 10565 99 | 517.00 11250 105 | 606.00 11800 111 | 700.00 12438 117 | 797.00 12992 122 | 933.00 13694 129 | 9605 | 940.00 |

Portable Hoisting Engine.



Hoisting Engine and Boiler.

WE here illustrate a single drum hoisting engine, from four to forty horse power, with upright boiler and single or duplex steam engine, used by stevedores, pile drivers, contractors, builders, wreckers, miners, sewer constructors, railway companies, etc. for hoisting purposes.

These engines and boilers are mounted on axles, wheels and springs, if so required, with house complete for stevedore's use. The drum is connected with large gear wheel by improved clutch, handle of which is shown in cut, the treadle below controls break to hold any load the hoisting rope will carry, and load may be lowered by break at any speed desired.

We are prepared to furnish any size and style besides special sizes given in table, and with one or two drums as required. The drums are from six to eighteen inches in diameter. Boilers fired up before leaving shop and engines warranted to be in perfect working order.

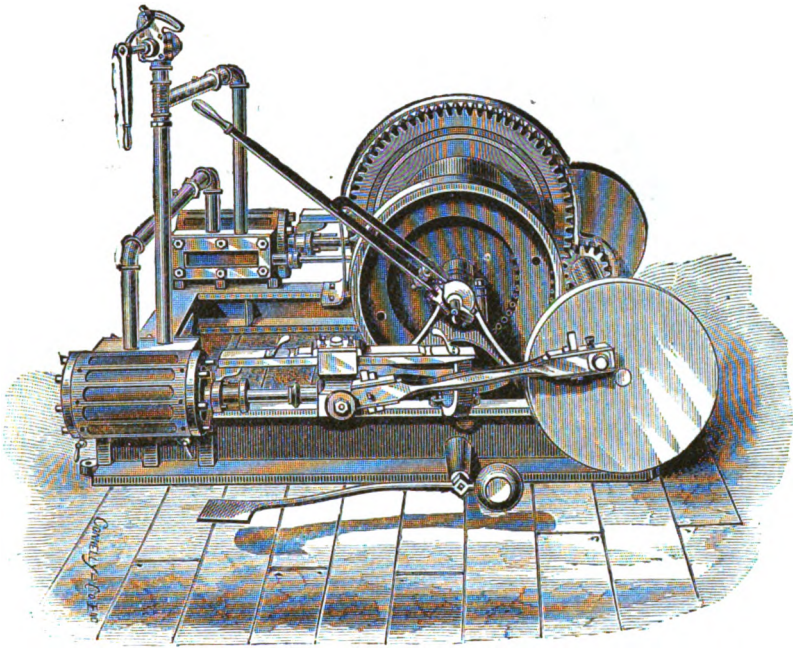
The advantage of the double or duplex engine is the certainty of starting at any time, as the engines work at right angles to each other and there is consequently no dead point.

UPRIGHT BOILER AND SINGLE ENGINE.

SAME WITH DUPLEX ENGINE.

| | 4 | 6 | 7 | 8 | 10 | 13 | 16 | 20 | 25 | 30 | 8 | 10 | 14 | 20 | 25 | 30 |
|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| Horse Power..... | 4 | 6 | 7 | 8 | 10 | 13 | 16 | 20 | 25 | 30 | 8 | 10 | 14 | 20 | 25 | 30 |
| Cylinder..... | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| Diameter..... | 4½ | 5½ | 6 | 6½ | 7 | 8 | 9 | 10 | 11 | 12 | 4½ | 5½ | 6 | 7 | 8 | 9 |
| Stroke..... | 8 | 12 | 12 | 12 | 12 | 12 | 15 | 15 | 18 | 18 | 8 | 12 | 12 | 12 | 12 | 15 |
| Revolutions per Minute..... | 175 | 150 | 150 | 150 | 150 | 125 | 125 | 125 | 120 | 120 | 175 | 150 | 150 | 150 | 125 | 120 |
| Fly Wheel..... | | | | | | | | | | | | | | | | |
| Diameter..... | 24 | 29 | 29 | 29 | 29 | 32 | 32 | 36 | 54 | 54 | 24 | 29 | 29 | 29 | 36 | 48 |
| Face..... | 4 | 6 | 7 | 7 | 7 | 8 | 8 | 10 | 12 | 15 | 4 | 6 | 7 | 7 | 10 | 12 |
| Boiler..... | | | | | | | | | | | | | | | | |
| Diameter..... | 28 | 30 | 32 | 36 | 36 | 42 | 42 | 48 | 54 | 54 | 32 | 36 | 42 | 42 | 54 | 54 |
| Height..... | 62 | 68 | 68 | 68 | 74 | 77 | 77 | 77 | 84 | 96 | 68 | 74 | 77 | 96 | 84 | 96 |
| Tubes..... | | | | | | | | | | | | | | | | |
| Diameter..... | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Length..... | 42 | 48 | 48 | 48 | 54 | 54 | 54 | 54 | 62 | 72 | 48 | 54 | 54 | 72 | 60 | 72 |
| Number..... | 40 | 48 | 60 | 70 | 70 | 100 | 100 | 180 | 186 | 186 | 61 | 70 | 100 | 100 | 186 | 186 |
| Frame..... | | | | | | | | | | | | | | | | |
| Width..... | 36 | 40 | 40 | 40 | 43 | 52 | 52 | 58 | 64 | 64 | 40 | 43 | 52 | 52 | 64 | 64 |
| Length..... | 59 | 75 | 75 | 75 | 75 | 84 | 84 | 84 | 94 | 94 | 75 | 75 | 84 | 84 | 94 | 94 |
| Hoisting Power..... | 1,600 | 1,800 | 2,200 | 2,600 | 3,000 | 3,600 | 4,000 | ..... | ..... | ..... | 3,200 | 3,600 | 3,600 | 4,400 | 6,000 | 7,200 |
| Total Weight..... | 3,000 | 3,800 | 4,200 | 4,400 | 4,600 | 5,800 | 6,800 | 7,800 | 8,800 | 9,800 | 4,500 | 5,200 | 6,800 | 7,600 | 9,500 | 11,600 |

Hoisting Engines.



Duplex Horizontal Hoisting Engine.

THE above cut represents our Duplex Horizontal Hoisting Engine without steam boiler, but in other respects similar to our portable engines and boilers of from four to forty horse power.

These machines are superior in every way to any other in the market, being not only constructed of the best material and workmanship but economical as well as effective in operation.

The advantage of the double engine is the certainty of starting at any time, as the engines work at right angles to each other and have consequently no dead point.

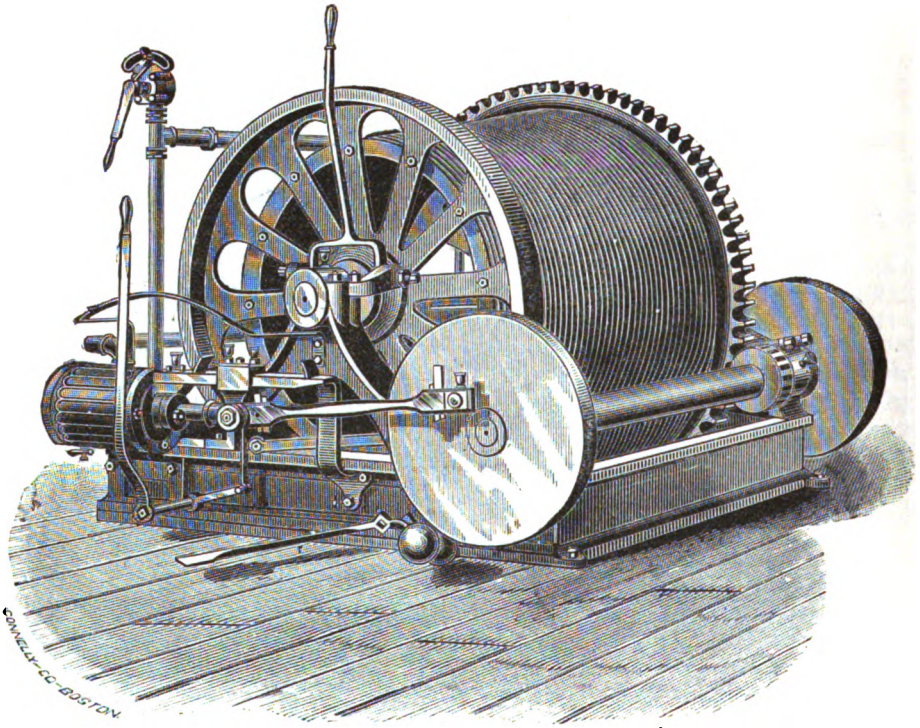
The drums are from six to eighteen inches in diameter, as may be ordered; and are gov-

erned by improved clutch and friction break, handle and treadle of which are shown in cut.

We are prepared to furnish any size to order and with one or two drums as required. The engines are thoroughly tried before leaving the shop and are warranted to be in good working order when delivered.

They are compactly built, all working parts being in full view of the engineer, and under his immediate control. The different parts are put together with bolts and nuts, and can be shipped whole, or packed in separate parcels for convenience in handling and ease in transporting on the backs of animals over rough country roads or mountain passes.

Hoisting Engines.



Single Drum Hoisting Engine.

THE above hoisting machine has one large grooved drum and is worked by two engines. It is particularly adapted for raising heavy loads, especially where wire cables are required.

The engines work at right angles to each other and are governed by a reversible link-motion, by which the load may be raised or lowered at any desired speed. They are constructed to run at great speed without jar or noise and are geared to exert great hoisting power.

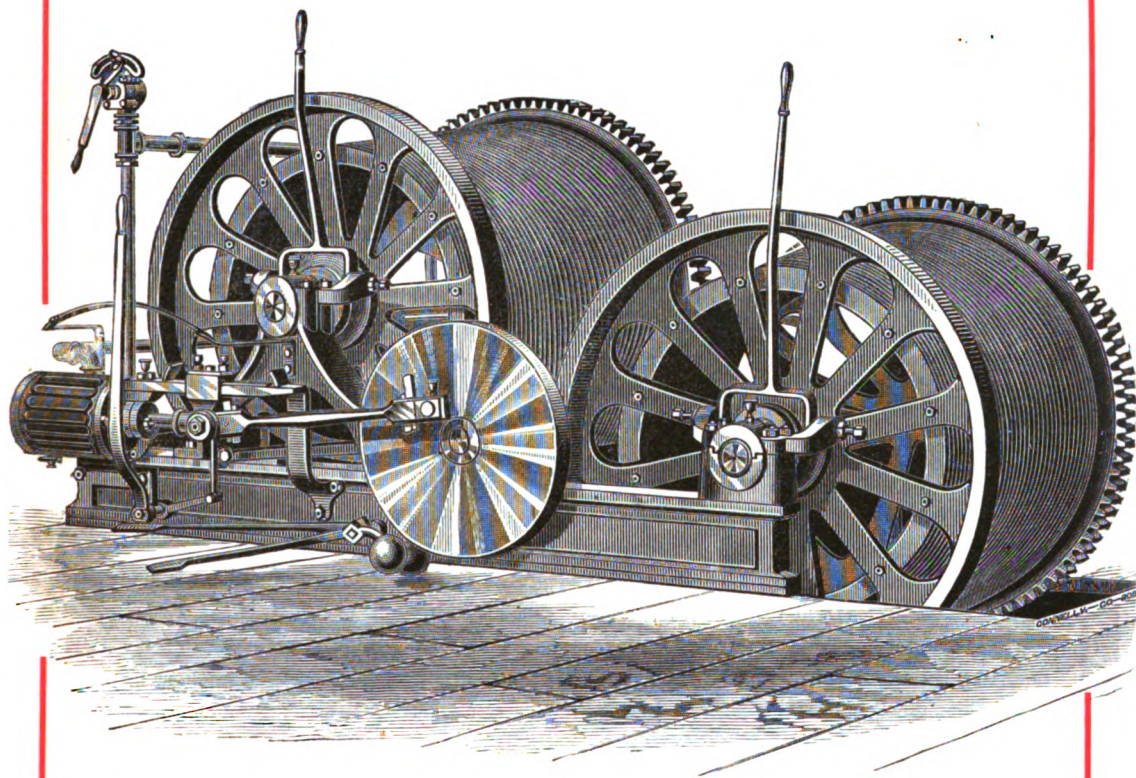
A friction break and improved clutch, worked by treadle and handle shown in the engraving, may be used to throw engines out of

gear and hold load at any point, or to lower away at will without reversing or entirely stopping the engines.

Where it is intended to use these engines for running freight or passenger elevators, the link-motion may be directly connected with hatch-way cable, and the speed and direction controlled from the elevator cage or platform.

We are prepared to furnish these machines, either double or single of any desired size and power. Parties ordering will please be particular to state exactly the nature of the work required to be performed, and weight of heaviest load machine is to lift.

Hoisting Engines.



Double Drum Hoisting Engine.

THE large hoisting engine illustrated above is constructed with duplex engines and two drums; it is built for hoisting heavy loads, and is particularly adapted to mining shafts, elevators, inclined hoists on canals or railways, and other work where steel or iron wire cables have to be used. For this reason the drums are grooved and of large diameter.

The engines work at right angles to each other, and are governed by a reversible link-motion for raising or lowering loads at any speed desired. They are constructed to run at great speed without jar or noise, engine shaft

being suitably geared to reduce speed and exert great hoisting power.

The drums are separately controlled by friction brakes and improved clutches operated by treadles and handles shown in the engraving; it is, therefore, suitable for use in two shafts or in double compartment shaft to be worked independently. The drums may be wound in opposite directions so as to hoist with one while lowering with the other, when used to work elevator cages or platforms they counterweigh each other and save considerable engine power.

Compressed Air as a Motive Power.

IN tunnels and mining shafts steam cannot be used to any great advantage as a motive power, owing to the loss of pressure through long lines of piping, and loss from condensation. The exhaust steam from the drilling machines is a serious annoyance to the workmen, as it renders the headings hot, damp, and uncomfortable, and makes rapid and effective work practically impossible. Furthermore, the heat radiated by the steam pipes in all the shafts and passages through which they are laid, offsets to a considerable degree the benefits of whatever ventilation may be employed.

To meet these difficulties the use of compressed air has been devised; it has all the essential qualities of steam, and can be conveyed any distance without material loss of pressure. It cools when expanding, and serves to ventilate remote parts of the mine, otherwise inaccessible to natural methods of ventilation, the drills being operated in the headings where ventilation is most needed.

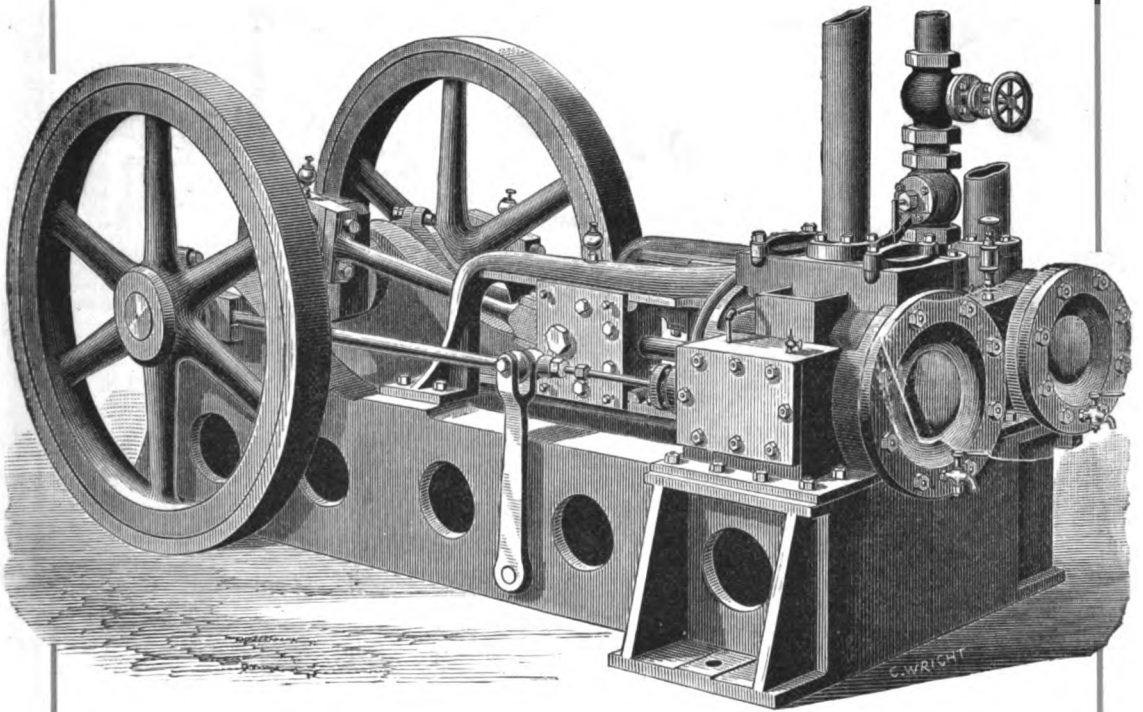
The steam boiler, engine, air compressor, and reservoir are usually located at the mouth of the shaft or tunnel, this being generally the most economical for the transportation of fuel, as well as the consumption of steam, but where two or more shafts are to be reached, or the entrance to the mine is on the steep side of a mountain, a more convenient location may be chosen.

In order to keep up a constant and steady pressure to equalize the supply of compressed air to the various drilling and other machines, a large air tank or reservoir is employed, which receives the air direct from the compressors. From this reservoir the iron supply pipes are laid in the directions required, and may be permanently fastened up or laid down

in the main shafts and passages of the mine, with outlets and valves located at the various points necessary. From these, temporary pipes and flexible rubber hose are used to connect the pipes with the different mining machines to be run by compressed air.

We illustrate and describe on the following pages air compressors of various styles, which will be found to be greatly improved since machines of this nature were first introduced. These compressors are adapted to all purposes where a steady pressure of air is required for rock drilling, submarine drilling, caisson work, hoist engines, pumps, etc.

Compressed air has of late been successfully employed as a substitute for steam to run dummy engines and locomotives, the advantage being in the employment of but one man on each locomotive, and in there being no coal and water to carry. The engine is constructed much the same as locomotive engines usually are, one or more long iron cylinders, containing highly compressed air, being substituted for the boiler. These cylinders are portable, and when exhausted are taken out at the railway compressor shops, and replaced with others previously pumped with air to the requisite pressure. The connection being made with the pressure pipe of the engine, the whole machine is under control of the driver by the use of the valve lever and reversing bar, the air brake being connected direct, instead of the exhaust as now produced by steam jet. For city railroads, whether elevated or surface, it is much preferred for the absence of smoke, cinders, coal dust, and noise; while in underground roads this method is indispensable for the same reasons given for its use in working mines and cutting tunnels.



The Ingersoll Air Compressor.

This compressor has one steam and one double acting air cylinder placed horizontally side by side. The power is applied to the air cylinder by means of a double crank shaft, having a balance wheel at each end. The greatest power of the engine, *i. e.*, the beginning of the stroke, is applied at the point of greatest resistance in the air cylinder, *i. e.*, the end of the stroke, thus securing a uniform motion and high speed.

Water is admitted into the air cylinder for lubricating and cooling purposes. The inlet valve is a balanced slide valve moved by eccentric on main shaft, while the delivery valves are poppet valves on the top of each end of the cylinder. The entire volume of air is discharged at each stroke of the piston, the empty spaces being filled with water.

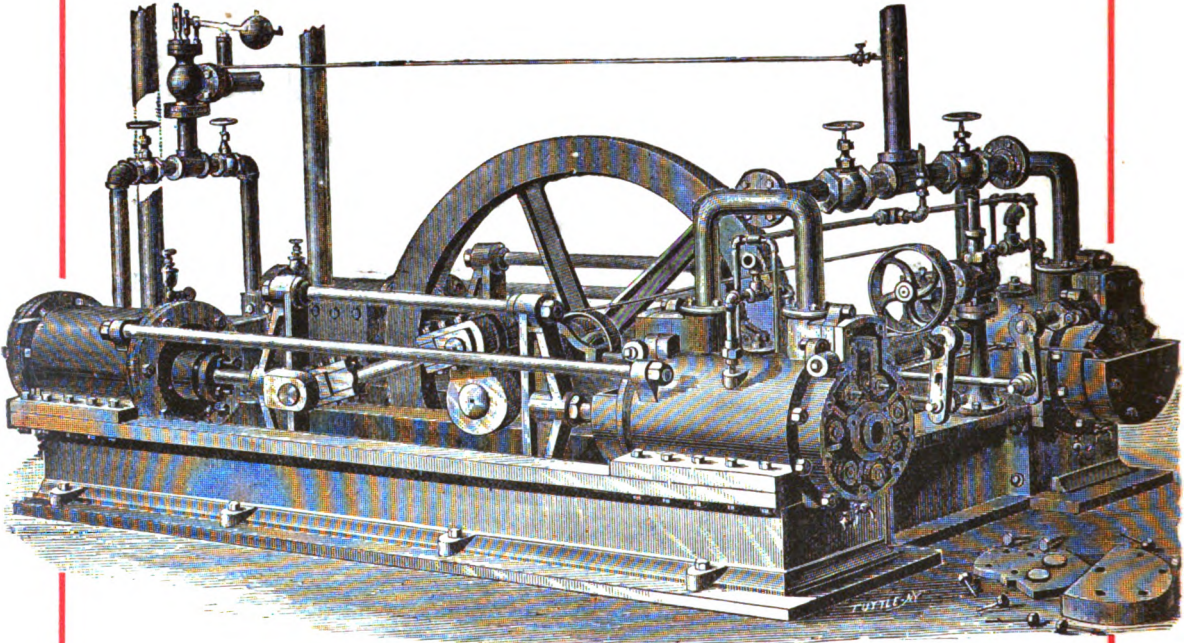
A compressor without the engine attachment, to be run by a belt from water, steam or other power, is also made, for those who require such a machine.

STEAM ENGINE AIR COMPRESSOR.

| | | | |
|------------------------------|---------|---------|---------|
| Size, Number..... | 2 | 3 | 4 |
| Diameter Steam Cylinder..... | 10 | 12 | 14 |
| Diameter Air Cylinder..... | 12 | 14 | 16 |
| Stroke..... | 12 | 14 | 16 |
| Revolutions per Minute..... | 125 | 110 | 100 |
| Cubic Feet per Minute..... | 200 | 350 | 400 |
| Size of Steam Pipe..... | 2 | 2½ | |
| Size of Exhaust Pipe..... | 3 | 3 | |
| Size of Air Discharge..... | 3 | 3 | |
| Number of Drills Run..... | 2 | 4 | |
| Weight, Complete..... | 5,500 | 8,000 | 13,000 |
| Price, Complete..... | \$1,200 | \$1,600 | \$2,000 |
| With Adjustable Cut-off..... | \$1,500 | \$1,900 | \$2,500 |

SINGLE BELT AIR COMPRESSOR.

| | | | |
|-----------------------------|---------|---------|---------|
| Size, Number..... | 2 | 3 | 4 |
| Diameter Air Cylinder..... | 12 | 14 | 16 |
| Length of Stroke..... | 12 | 14 | 16 |
| Revolutions per Minute..... | 125 | 110 | 100 |
| Cubic Feet per Minute..... | 200 | 350 | 400 |
| Diameter of Pulley..... | 42 | 50 | 60 |
| Face of Pulley..... | 12 | 18 | 24 |
| Number of Drills Run..... | 2 | 4 | 6 |
| Weight, Complete..... | 4,000 | 5,500 | 9,500 |
| Price, Complete..... | \$1,000 | \$1,300 | \$1,600 |



The Clayton Air Compressor.

THIS compressor has the following improvements: An automatic air governor (Steel's Patent), which can be set to any pressure desired and will never allow the air pressure on the drills or other machinery to vary, whatever the steam pressure may be, or the number of rock drills in operation.

The patent automatic feed supplies the air cylinders with oil or water in exact quantities for lubricating and cooling, according to rate of speed.

Patent water jackets around air cylinder, so arranged as to economize the cooling properties of the water and produce the best effect in giving a uniform degree of temperature the whole length of cylinder.

The discharge valves lift automatically when working pressure of air is attained, and are

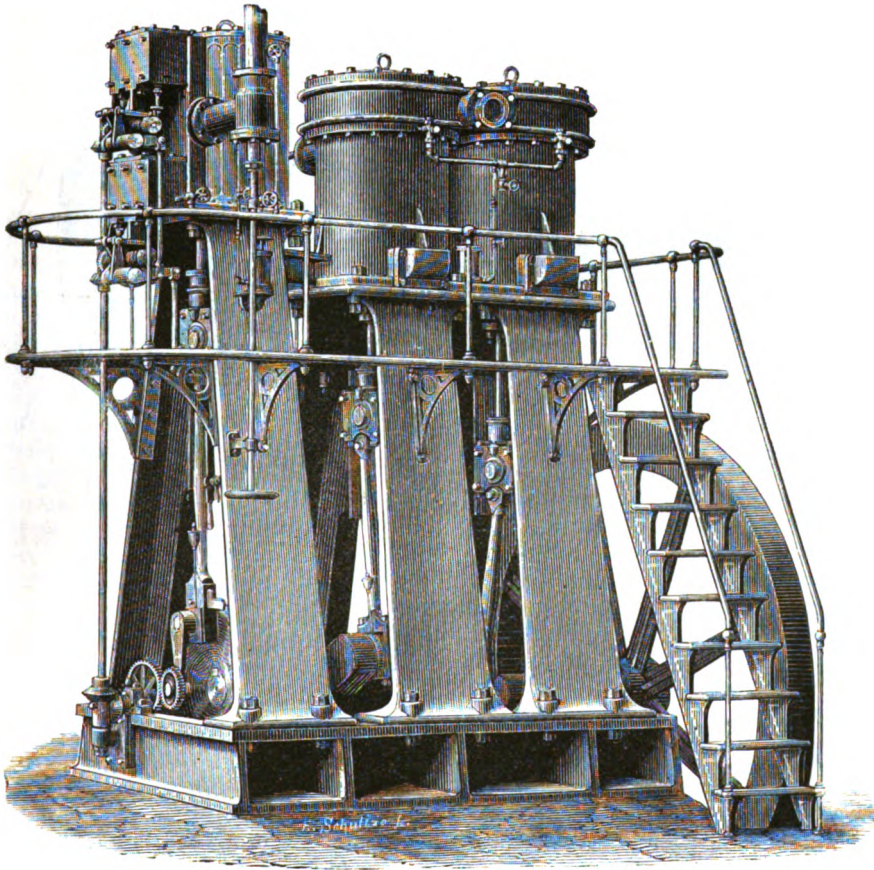
constructed with a view to avoiding trouble from grit or dust.

The suction valves open with the least pressure of the atmosphere and allow the cylinder to fill to the end of the stroke; they are instantly closed on return of piston, and no air is allowed to escape.

In case of accident to either compressor, the other may be disconnected from it and run at an increased speed, so that work need not be delayed while repairs are being made.

The patent discharge valves, patent sliding journal boxes, patent air governor, patent automatic water or oil feed, patent water jacket, etc., before described, are all included in our price of duplex air compressors, and all except the air governor in price list of single compressors.

| Number..... | 1 | 2 | 2½ | 3½ | 4 | 5 | 6 | 7 |
|------------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| <i>Steam Cylinder.</i> | | | | | | | | |
| Diameter..... | 8 | 9 | 10 | 12 | 14 | 16 | 16 | 18 |
| Stroke..... | 12 | 12 | 13 | 13 | 15 | 15 | 20 | 24 |
| <i>Air Cylinder.</i> | | | | | | | | |
| Diameter..... | 8 | 9 | 10 | 12 | 14 | 16 | 16 | 18 |
| <i>Per Minute.</i> | | | | | | | | |
| Revolutions..... | 140 | 130 | 130 | 130 | 120 | 100 | 100 | 90 |
| Cubic Feet of Air..... | 165 | 180 | 206 | 300 | 450 | 625 | 837 | 1128 |
| <i>Drills Run.</i> | | | | | | | | |
| Size..... | | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Number..... | 2 | 3 | 4 | 6 | 8 | 10 | 14 | 20 |
| Weight..... | 1,800 | 2,000 | 4,500 | 8,000 | 10,000 | 13,000 | 15,000 | 18,000 |
| Price..... | \$1,320 | \$1,375 | \$1,540 | \$2,200 | \$3,025 | \$4,125 | \$4,950 | \$6,050 |



The Burleigh Air Compressor.

THE above air compressor, consisting of a steam engine and two force pumps, is constructed on the most approved plan; nothing being omitted to render it reliable and effective for mining or quarrying purposes. The cranks are so adjusted as to get the greatest power of the engine at the exact point of greatest resist-

ance, and relatively proportioned to produce the same pressure of air as that of steam used.

Where extra high pressure of air is required and less in quantity, or a greater quantity at low pressure, differently proportioned machines can be ordered to suit the requirements of various kinds of work.

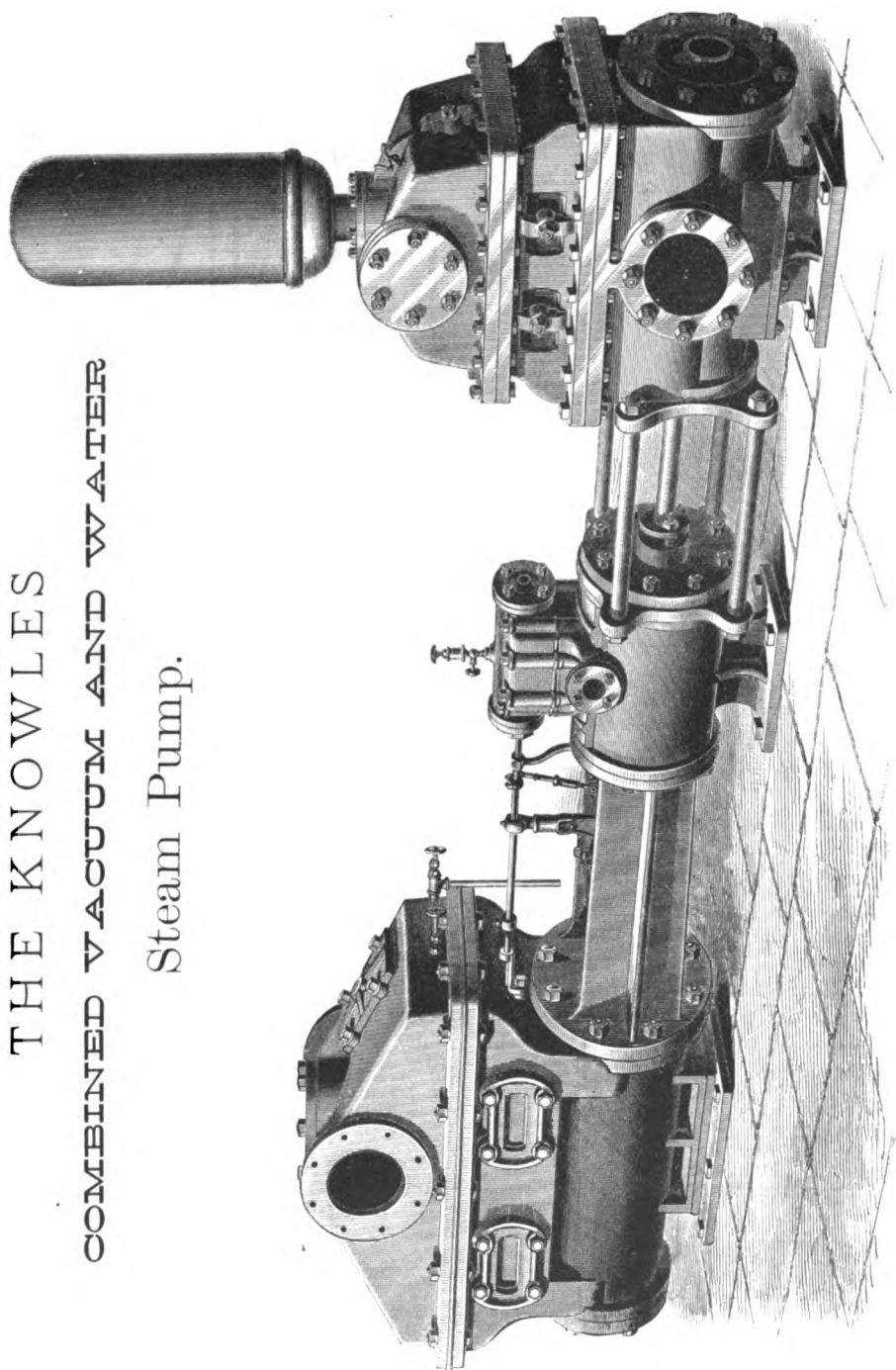
COMPRESSOR, WITHOUT ADJUSTABLE CUT-OFF.

COMPRESSOR, WITH ADJUSTABLE CUT-OFF.

| Number | 1 | 2 | 3 | 4 | 1* | 2* | 4* | 6* | 7* | 10* |
|------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| <i>Steam Cylinder.</i> | | | | | | | | | | |
| Diameter | 7 | 9 | 12 | 15 | 9 | 10 | 15 | 18 | 18 | 22 |
| Stroke | 15 | 18 | 18 | 18 | 15 | 18 | 18 | 24 | 24 | 24 |
| <i>Air Cylinder.</i> | | | | | | | | | | |
| Diameter | 10½ | 12 | 14½ | 16½ | 10½ | 12 | 16½ | 20 | 24 | 26 |
| Stroke | 10 | 15 | 15 | 15 | 12 | 15 | 16 | 20 | 20 | 22 |
| <i>Per Minute.</i> | | | | | | | | | | |
| Revolutions | 110 | 100 | 100 | 95 | 110 | 100 | 95 | 85 | 80 | 75 |
| Cubic Feet of Air | 110 | 195 | 292 | 352 | 120 | 195 | 375 | 615 | 880 | 1000 |
| Small Drills Run | 2 | 3 | 4 | 6 | 2 | 3 | 6 | 7 | 8 | 15 |
| Large Drills Run | 1 | 2 | 3 | 4 | 1 | 2 | 4 | 6 | 7 | 12 |
| Horse Power Required | 12 | 24 | 35 | 45 | 10 | 18 | 35 | 60 | 75 | 90 |
| Weight of Compressor | 5,600 | 8,600 | 13,500 | 15,000 | 7,600 | 10,000 | 17,000 | 40,000 | 45,000 | 55,000 |
| Price, Complete | \$1,200 | \$2,000 | \$2,900 | \$3,600 | \$1,600 | \$2,300 | \$4,000 | \$7,000 | \$7,500 | \$9,000 |

* Engines with poppet valves and forged iron crank shafts.

THE KNOWLES
COMBINED VACUUM AND WATER
Steam Pump.



The Knowles Steam Pumps.

GENERAL DESCRIPTION.

SINCE these pumps were first introduced they have been adapted to every conceivable requirement of the trade; and while their reputation was established from the first, it has been the manufacturer's aim to constantly improve them. It is now claimed that these pumps, in their manifold varieties, are unequalled for efficiency, durability, simplicity and certainty of action.

These pumps are direct acting, having the steam piston and one or more working pistons or plungers on the same piston rod, all having equal motion on central or parallel lines. They are long connected, thereby giving easy access to stuffing boxes, and preventing the piston rod running from hot steam to cold water, which obviates the consequent leaking and tearing away of stuffing boxes, loosening pistons, breaking piston rods, etc., inevitable in short connected pumps.

The steam valve is an ordinary flat slide valve working by horizontal motion only; it is the most favorable for enduring tightness even after prolonged wear. The valve driving piston receives a slight rotary motion from the

rocker arm, and is thereby, at each end of the stroke, put in position to be driven horizontally by steam pressure, carrying the slide valve along with it. These two are the only moving parts in the steam chest and are each made in one piece, together controlling the steam pressure and exhaust. This combination forms a positive valve motion as it can never get into a position that will prevent the pump from starting as soon as steam, air or water pressure is admitted.

These pumps are symmetrical in outline, having great strength without excessive weight or clumsiness. The material and workmanship are of the very best throughout, and parts are made interchangeable. The cylinders are made from iron specially adapted to this purpose, and the water cylinders are lined with government standard gun metal when liquids pumped require it.

The piston rods, stuffing boxes and glands on all small and medium sized pumps are of the best gun metal, while rods for larger sizes are steel or cold rolled iron, with composition covering.

COMBINED VACUUM AND WATER PUMPS.

On the opposite page we illustrate a combined air and water pump, producing a vacuum with one piston and pumping liquid with the other; both are actuated by the same steam piston, and all of which are on the same piston rod. This produces a simple, compact machine, capable of doing double duty and particularly fitted for use in sugar refineries, sugar plantations, manufacturers of bark extract, malt extract, condensed milk, glue, etc., and for surface condenser and circulating pump.

It will produce a more perfect vacuum, wet or dry, than any other form of vacuum pump, at the same time elevating water to any desired height for condensing or other purposes. The stroke is always uniform and regular, and no jar or pounding is ever experienced under any pressure, or at any rate of speed.

The stuffing box on vacuum pump is always sealed with water by means of water reservoir, arranged with packing glands.

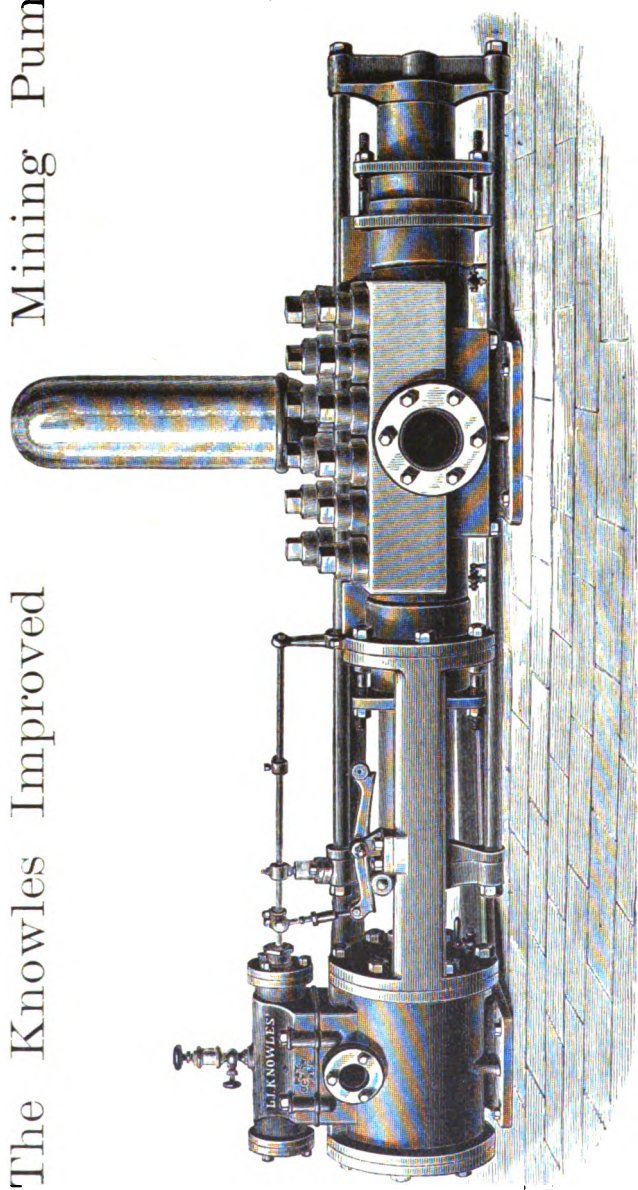
The water pump can be instantly disconnected, if necessary.

These pumps are also constructed vertically, occupying the least possible amount of space consistent with proper strength and care of handling. A slight alteration in the arrangement of the steam, air, and water cylinders is made in this style, and the addition of independent feed and bilge pumps can be made, if required.

We are prepared to furnish these pumps of any proportion of steam, air, and water cylinders desired. Parties ordering steam pumps will please state particulars of work required to be performed.

Mining Pump.

The Knowles Improved



| Steam Cylinder. | | | | | | | | | | Water Cylinder. | | | | | | | | | |
|-----------------|----|-------------|-----|------------------------|-----|-------------------------|-----|-----------------|-----|-------------------|-----|--------------|-----|----------------|-----|------------|--|--|--|
| Diameter..... | | Stroke..... | | Capacity, Gallons..... | | Strokes per Minute..... | | Steam Pipe..... | | Exhaust Pipe..... | | Suction..... | | Discharge..... | | Price..... | | | |
| 5½ | 7 | 3¼ | 25 | 3¼ | 34 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 6 | 7½ | 3½ | 34 | 3½ | 34 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 7 | 10 | 4½ | 69 | 4½ | 69 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 8 | 10 | 5 | 85 | 5 | 85 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 10 | 12 | 1.02 | 275 | 1.02 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 12 | 12 | 1.46 | 250 | 1.46 | 250 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 14 | 12 | 1.99 | 250 | 1.99 | 250 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 16 | 12 | 2.61 | 250 | 2.61 | 250 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 18 | 12 | 3.24 | 250 | 3.24 | 250 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 20 | 12 | 3.87 | 250 | 3.87 | 250 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 24 | 12 | 5.16 | 275 | 5.16 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 28 | 12 | 6.45 | 275 | 6.45 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 32 | 12 | 7.74 | 275 | 7.74 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 36 | 12 | 9.03 | 275 | 9.03 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 40 | 12 | 10.32 | 275 | 10.32 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 44 | 12 | 11.61 | 275 | 11.61 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 48 | 12 | 12.90 | 275 | 12.90 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 52 | 12 | 14.19 | 275 | 14.19 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 56 | 12 | 15.48 | 275 | 15.48 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 60 | 12 | 16.77 | 275 | 16.77 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 64 | 12 | 18.06 | 275 | 18.06 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 68 | 12 | 19.35 | 275 | 19.35 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 72 | 12 | 20.64 | 275 | 20.64 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 76 | 12 | 21.93 | 275 | 21.93 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 80 | 12 | 23.22 | 275 | 23.22 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 84 | 12 | 24.51 | 275 | 24.51 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 88 | 12 | 25.80 | 275 | 25.80 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 92 | 12 | 27.09 | 275 | 27.09 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 96 | 12 | 28.38 | 275 | 28.38 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 100 | 12 | 29.67 | 275 | 29.67 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 104 | 12 | 30.96 | 275 | 30.96 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 108 | 12 | 32.25 | 275 | 32.25 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 112 | 12 | 33.54 | 275 | 33.54 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 116 | 12 | 34.83 | 275 | 34.83 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 120 | 12 | 36.12 | 275 | 36.12 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 124 | 12 | 37.41 | 275 | 37.41 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 128 | 12 | 38.70 | 275 | 38.70 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 132 | 12 | 40.00 | 275 | 40.00 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 136 | 12 | 41.29 | 275 | 41.29 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 140 | 12 | 42.58 | 275 | 42.58 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 144 | 12 | 43.87 | 275 | 43.87 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 148 | 12 | 45.16 | 275 | 45.16 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 152 | 12 | 46.45 | 275 | 46.45 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 156 | 12 | 47.74 | 275 | 47.74 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 160 | 12 | 49.03 | 275 | 49.03 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 164 | 12 | 50.32 | 275 | 50.32 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 168 | 12 | 51.61 | 275 | 51.61 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 172 | 12 | 52.90 | 275 | 52.90 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 176 | 12 | 54.19 | 275 | 54.19 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 180 | 12 | 55.48 | 275 | 55.48 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 184 | 12 | 56.77 | 275 | 56.77 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 188 | 12 | 58.06 | 275 | 58.06 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 192 | 12 | 59.35 | 275 | 59.35 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 196 | 12 | 60.64 | 275 | 60.64 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 200 | 12 | 61.93 | 275 | 61.93 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 204 | 12 | 63.22 | 275 | 63.22 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 208 | 12 | 64.51 | 275 | 64.51 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 212 | 12 | 65.80 | 275 | 65.80 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 216 | 12 | 67.09 | 275 | 67.09 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 220 | 12 | 68.38 | 275 | 68.38 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 224 | 12 | 69.67 | 275 | 69.67 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 228 | 12 | 70.96 | 275 | 70.96 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 232 | 12 | 72.25 | 275 | 72.25 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 236 | 12 | 73.54 | 275 | 73.54 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 240 | 12 | 74.83 | 275 | 74.83 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 244 | 12 | 76.12 | 275 | 76.12 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 248 | 12 | 77.41 | 275 | 77.41 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 252 | 12 | 78.70 | 275 | 78.70 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 256 | 12 | 80.00 | 275 | 80.00 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 260 | 12 | 81.29 | 275 | 81.29 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 264 | 12 | 82.58 | 275 | 82.58 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 268 | 12 | 83.87 | 275 | 83.87 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 272 | 12 | 85.16 | 275 | 85.16 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 276 | 12 | 86.45 | 275 | 86.45 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 280 | 12 | 87.74 | 275 | 87.74 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 284 | 12 | 89.03 | 275 | 89.03 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 288 | 12 | 90.32 | 275 | 90.32 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 292 | 12 | 91.61 | 275 | 91.61 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 296 | 12 | 92.90 | 275 | 92.90 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 300 | 12 | 94.19 | 275 | 94.19 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 304 | 12 | 95.48 | 275 | 95.48 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 308 | 12 | 96.77 | 275 | 96.77 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 312 | 12 | 98.06 | 275 | 98.06 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 316 | 12 | 99.35 | 275 | 99.35 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 320 | 12 | 100.64 | 275 | 100.64 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 324 | 12 | 101.93 | 275 | 101.93 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 328 | 12 | 103.22 | 275 | 103.22 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 332 | 12 | 104.51 | 275 | 104.51 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 336 | 12 | 105.80 | 275 | 105.80 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 340 | 12 | 107.09 | 275 | 107.09 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 344 | 12 | 108.38 | 275 | 108.38 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 348 | 12 | 109.67 | 275 | 109.67 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | 300 | 1 | | | |
| 352 | 12 | 110.96 | 275 | 110.96 | 275 | 1 | 300 | 1 | 300 | 1 | 300 | | | | | | | | |

The Knowles Steam Pumps.

IMPROVED MINING PUMP.

THIS pump is designed for pumping water containing sediment or gritty matter; it is warranted to work well under extremely severe duty.

For mining purposes it is particularly fitted, as the peculiar arrangement of the valves renders this pump exceedingly durable. This is the only form of pump found to give satisfaction on lifts of 700 feet and over, as they are made from special patterns, extra heavy, and fully guaranteed.

Plunger pumps have advantages over piston pumps for pumping gritty or impure water, at any temperature.

The only wear upon the plunger is the packing in the stuffing boxes, which is outside and can quickly be renewed, while any leak can be instantly detected. They are particularly desirable in places where the work is severe and continuous.

The water cylinder and chest are in one piece, without bolts or joints. The cap valves are with removable seats, and the plungers are made from government standard gun metal.

Longer strokes, or different proportions of cylinders from those given in the annexed table, will be made to order at short notice.

RAILROAD TANK PUMP.

For light service in elevating liquids to limited heights and short distances, the Tank Pump is exceptionally serviceable, as it possesses great pumping capacity, with a small consumption of steam.

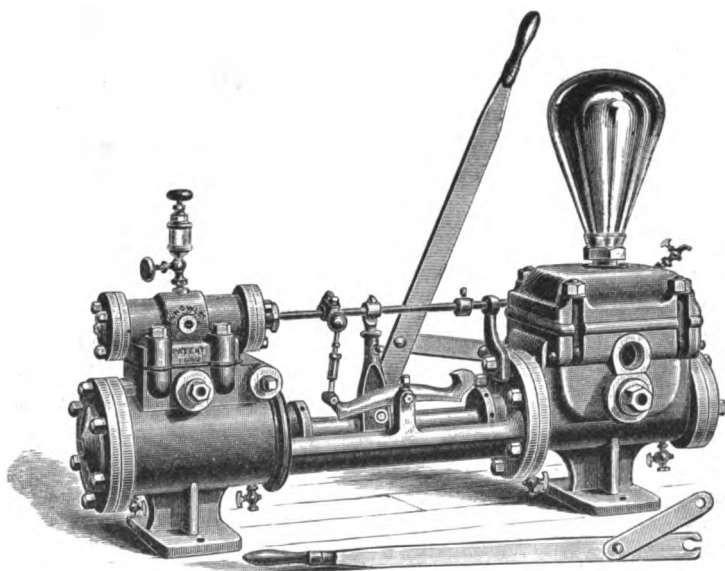
It is substantially made of good material and superior workmanship, and combines the advantages of simplicity, accessibility, durability, lightness, compactness and low price.

It runs without shock or pounding, being noiseless in its operation; it has all the improvements necessary to make it work satisfactorily, and is built from special patterns designed for the purpose.

We give below an abridged price list for some of the sizes made, but pumps of any size and proportion of steam and water cylinders can be furnished at the shortest notice.

| | | | | | | | | | | | |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <i>Steam Cylinder.</i> | | | | | | | | | | | |
| Diameter..... | 4 | 4 | 5 | 5½ | 5½ | 6 | 7½ | 7½ | 8 | 8 | 8 |
| Stroke..... | 5 | 5 | 7 | 7 | 7 | 7 | 10 | 10 | 10 | 12 | 12 |
| <i>Water Cylinder.</i> | | | | | | | | | | | |
| Diameter..... | 3¼ | 4 | 4 | 5 | 5½ | 5½ | 7 | 7½ | 7½ | 8 | 8 |
| Capacity, Gallons..... | .14 | .27 | .39 | .51 | .72 | .72 | 1.64 | 1.91 | 1.91 | 1.74 | 1.99 |
| Strokes, per Minute..... | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| ..... | 300 | 300 | 300 | 300 | 300 | 300 | 275 | 275 | 275 | 250 | 250 |
| <i>Size of Pump.</i> | | | | | | | | | | | |
| Extreme Length..... | 34 | 34 | 44 | 44 | 44 | 44 | 56½ | 56½ | 56½ | 66¾ | 66¾ |
| Width..... | 8½ | 8½ | 12 | 12 | 12½ | 12½ | 19 | 19 | 19 | 19 | 20 |
| <i>Size of Pipes.</i> | | | | | | | | | | | |
| Steam Pipe..... | 1½ | 1½ | ¾ | ¾ | ¾ | ¾ | 1 | 1 | 1 | 1 | 1 |
| Exhaust Pipe..... | ¾ | ¾ | 1 | 1 | 1 | 1 | 1¼ | 1¼ | 1¼ | 1¼ | 1¼ |
| Suction Pipe..... | 2 | 2 | 2½ | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 |
| Discharge Pipe..... | 1½ | 1½ | 2 | 2½ | 2½ | 2½ | 4 | 4 | 4 | 5 | 5 |
| Price..... | \$175 | \$175 | \$228 | \$287 | \$300 | \$300 | \$375 | \$375 | \$387 | \$400 | \$425 |
| | | | | | | | | | | | \$450 |

The Knowles Steam Pump.



Boiler Feeding and Heavy Pressure Pump.

THE above cut represents one of the Knowles Boiler Feed Pumps. It shows the new patent valve motion and hand power lever, attached and detached. This pump is arranged either for hot or cold water as may be required; when it is required to pump both hot and cold water, the hot water pump should be ordered.

The Knowles Valve Motion being perfectly positive under any condition and in any position, the pump can be worked at the slowest possible speed, without danger of centering, or can be run with safety at high rates of

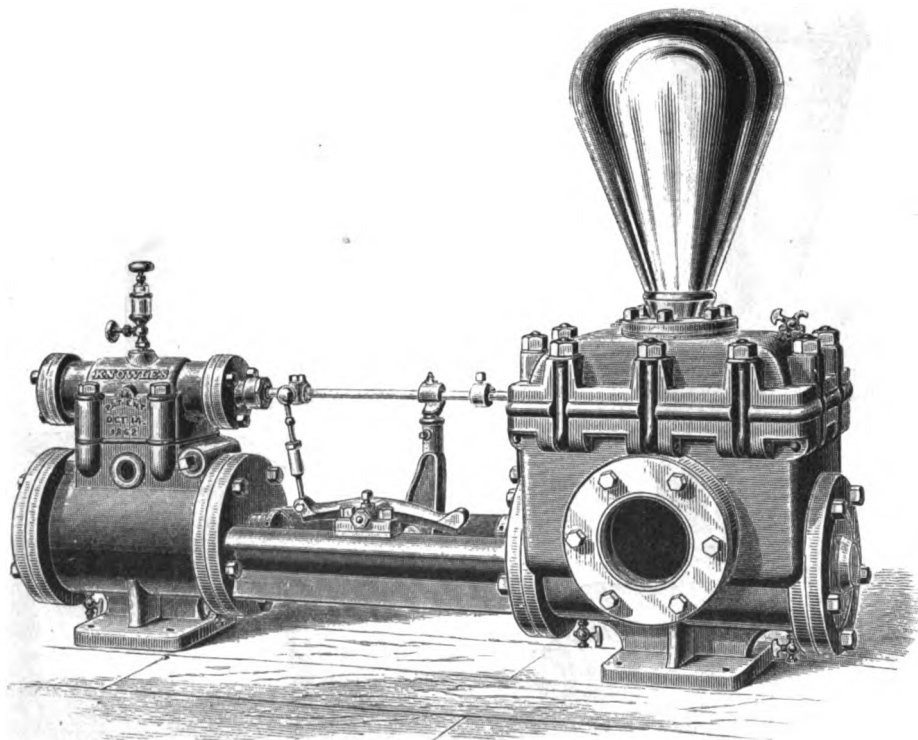
speed, making them efficient fire pumps.

Independent, direct acting steam pumps have a special advantage in boiler feeding, inasmuch as speed can be adjusted automatically, or run continuously, and maintain water at uniform height.

The Hand Power Lever Attachment is the only reliable appliance of its kind, and is invaluable for filling boilers when steam is down, for conflagrations or other cases of emergency. When pump is under steam, the hand lever can be removed by simply lifting it from its rests.

| Number..... | 0 | 1 | 2 | 3 | 4 | 4½ | 5 | 6 | 6½ | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|------------------------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|-------|-------|-------|-------|
| <i>Steam Cylinder.</i> | | | | | | | | | | | | | | | | | |
| Diameter..... | 3¼ | 3½ | 4 | 5 | 5½ | 7 | 7 | 7½ | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 30 |
| Stroke..... | 4 | 4 | 5 | 7 | 7 | 7 | 10 | 10 | 12 | 12 | 12 | 12 | 16 | 24 | 24 | 24 | 24 |
| <i>Water Cylinder.</i> | | | | | | | | | | | | | | | | | |
| Diameter..... | 2 | 2¼ | 2½ | 3¼ | 3¾ | 4 | 4½ | 5 | 5 | 6 | 7 | 8 | 10 | 12 | 14 | 16 | 18 |
| Gallons..... | .05 | .07 | .11 | .25 | .34 | .39 | .69 | .85 | 1.02 | 1.46 | 1.99 | 2.61 | 5.43 | 11.75 | 15.99 | 20.79 | 26.43 |
| Strokes per Minute. | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 300 | 300 | 300 | 275 | 275 | 275 | 250 | 250 | 250 | 200 | 200 | 200 | 200 | 180 | 180 | 150 | 150 |
| Steam Pipe..... | 1½ | 1½ | 1½ | 1½ | 1½ | 1½ | 1½ | 1½ | 1½ | 1½ | 2 | 2 | 2½ | 3½ | 3½ | 4 | 5 |
| Exhaust Pipe..... | 1¼ | 1¼ | 1¼ | 1¼ | 1¼ | 1¼ | 1¼ | 1¼ | 1¼ | 1¼ | 2½ | 2½ | 3 | 4 | 4 | 4½ | 6 |
| Suction..... | 1¼ | 1¼ | 1¼ | 2 | 2 | 2½ | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 8 | 10 | 12 | 14 |
| Discharge..... | 1 | 1 | 1 | 1½ | 1½ | 2 | 2½ | 2½ | 4 | 4 | 5 | 5 | 6 | 8 | 10 | 12 | 14 |
| Price..... | \$85. | \$125. | \$150. | \$200. | \$225. | \$275. | \$350. | \$375. | \$400. | \$450. | \$525. | \$600. | | | | | |

The Knowles Steam Pump.



Brewery Steam Pump.

ON this page we illustrate the Knowles Brewery Pump. It is superior to any other, and especially adapted to brewers' use. It is constructed in the most substantial manner, from new and improved patterns, and has the patented positive motion valve. The working parts are all of gun metal, and the pistons of both steam and water cylinders are self-adjusting, consequently the pumps will work perfectly in hot or cold liquid, and are always tight, even when changed suddenly from one to the other.

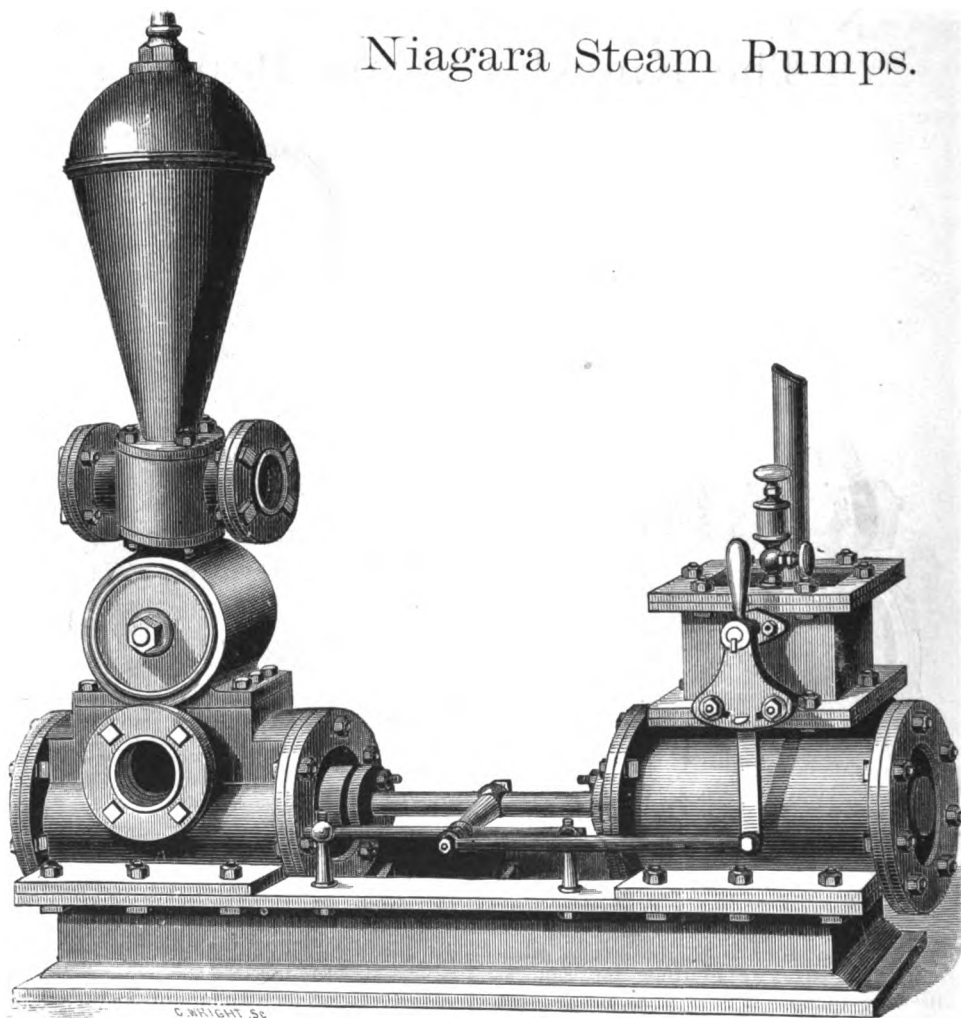
The air chamber is made of the best hammered copper (not spun up), and is tested under severe pressure.

These pumps work freely and without stopping or clogging, either upon thick beer mash at boiling temperature, hot or cold beer or water, and will deliver it at any height or distance required.

We will make to order other sizes besides those given in the annexed table, of any dimension required. Purchasers will please state for what purpose pump is to be used.

| | | | | | | | | | | | | |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <i>Steam Cylinder.</i> | | | | | | | | | | | | |
| Diameter..... | 5 | 5½ | 7½ | 8 | 8 | 8 | 10 | 10 | 12 | 12 | 10 | 10 |
| Stroke..... | 7 | 7 | 10 | 12 | 12 | 12 | 10 | 12 | 12 | 12 | 16 | 16 |
| <i>Water Cylinder.</i> | | | | | | | | | | | | |
| Diameter..... | 4 | 5½ | 7½ | 8 | 8 | 10 | 7 | 10 | 8 | 10 | 10 | 12 |
| Capacity..... | .89 | .72 | 1.72 | 1.47 | 2.61 | 4.06 | 2.00 | 4.06 | 2.61 | 4.06 | 5.43 | 7.83 |
| Strokes per Minute | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| ..... | 300 | 275 | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 225 | 225 |
| Steam Pipe..... | ¾ | ¾ | 1 | 1 | 1 | 1 | 1½ | 1½ | 2 | 2 | 1½ | 1½ |
| Exhaust Pipe..... | 1 | 1 | 1½ | 1½ | 1½ | 1½ | 1½ | 1½ | 2½ | 2½ | 1½ | 1½ |
| Suction..... | 2½ | 3 | 4 | 4 | 5 | 6 | 5 | 6 | 5 | 6 | 6 | 8 |
| Discharge..... | 2 | 2 | 3 | 4 | 5 | 6 | 5 | 6 | 5 | 6 | 6 | 6 |
| Price..... | \$285 | \$300 | \$375 | \$400 | \$450 | \$500 | \$475 | \$550 | \$550 | \$600 | \$650 | \$675 |

Niagara Steam Pumps.



Direct Acting Pump.

THE above cut represents the Direct Acting Niagara Steam Pump. It is simple in its construction, and can be readily taken apart and put together as occasion may require.

As far as is consistent with durability, it is cast in separate parts, so that in case of accident or breakage, only the parts immediately affected need be replaced.

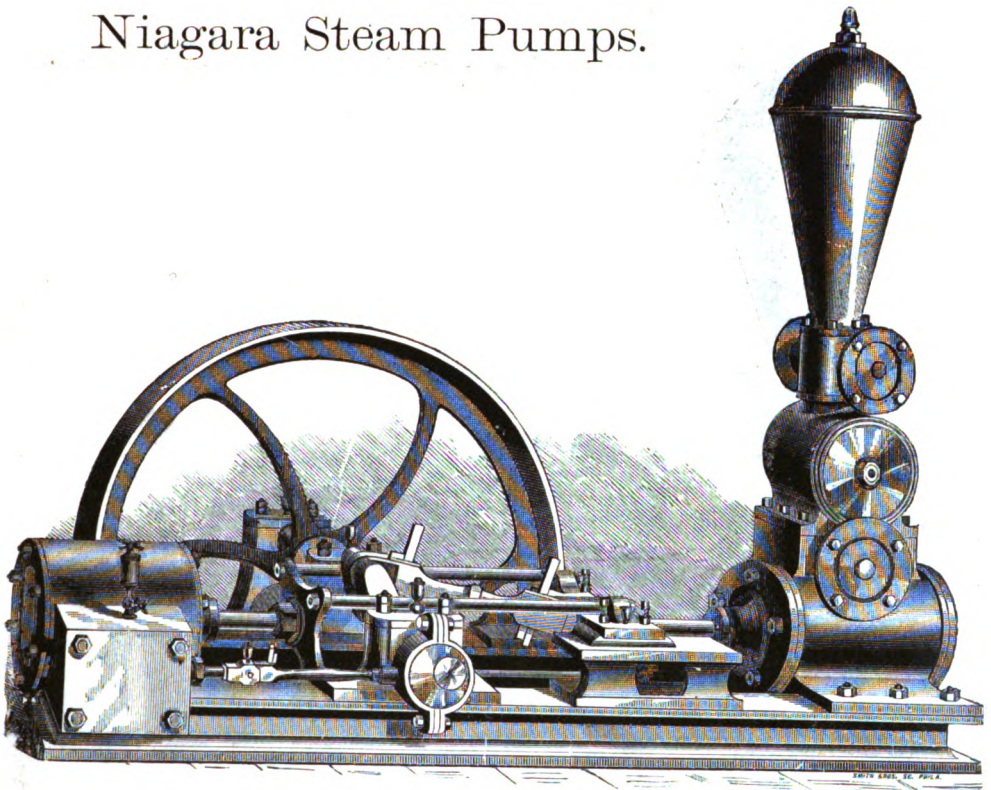
The Patent Steam Valve insures starting

engine, no matter at what point of the stroke piston may be, there is consequently no center for pump to get stuck on. It may be run at any rate of speed, with safety at high speed, and with positive motion at low speed.

It is a very satisfactory pump for use in mines and quarries, as it will work when submerged, and start with steam pipe full of water if steam be turned on.

| Number..... | 0 | A | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|
| Steam Cylinder. | | | | | | | | | | | | | | |
| Diameter..... | 3 | 3½ | 4 | 5 | 7 | 9 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 |
| Stroke..... | 3 | 6 | 6 | 8 | 9 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 |
| Pump Cylinder. | | | | | | | | | | | | | | |
| Diameter..... | 2 | 2 | 2 | 2½ | 3½ | 5 | 7 | 8½ | 10 | 12 | 14 | 16 | 18 | 20 |
| Per Minute. | | | | | | | | | | | | | | |
| No. of Strokes..... | 150 | 130 | 130 | 120 | 110 | 100 | 90 | 80 | 70 | 65 | 60 | 55 | 50 | 50 |
| No. of Gallons..... | 12 | 20 | 20 | 40 | 87 | 170 | 360 | 549 | 761 | 1144 | 1600 | 1994 | 2642 | 3586 |
| Price..... | \$85 | \$125 | \$140 | \$200 | \$275 | \$400 | \$525 | \$600 | \$900 | | | | | |

Niagara Steam Pumps.



Crank Pump and Engine.

THE crank and fly wheel pump, illustrated above, has the advantage of being available as an engine for transmitting power to other machinery while doing duty as a steam pump; the piston rod of the pump, however, may be disconnected from the cross head of the engine by unscrewing a single nut, thus utilizing the full power of the engine for other purposes when the pump is not required.

The fly wheel has face enough to carry a belt of proper width for ordinary work, which makes this form of pumping engine invaluable for use on the plantation, where the engine can be used to supply power for cotton gins and sugar mills, and the pump be used for pumping water, cane juice, etc., as may be required.

For sawing wood, as well as pumping water at rail way watering stations, it is unequalled,

as it does not readily get out of order and can be easily managed by men of ordinary intelligence.

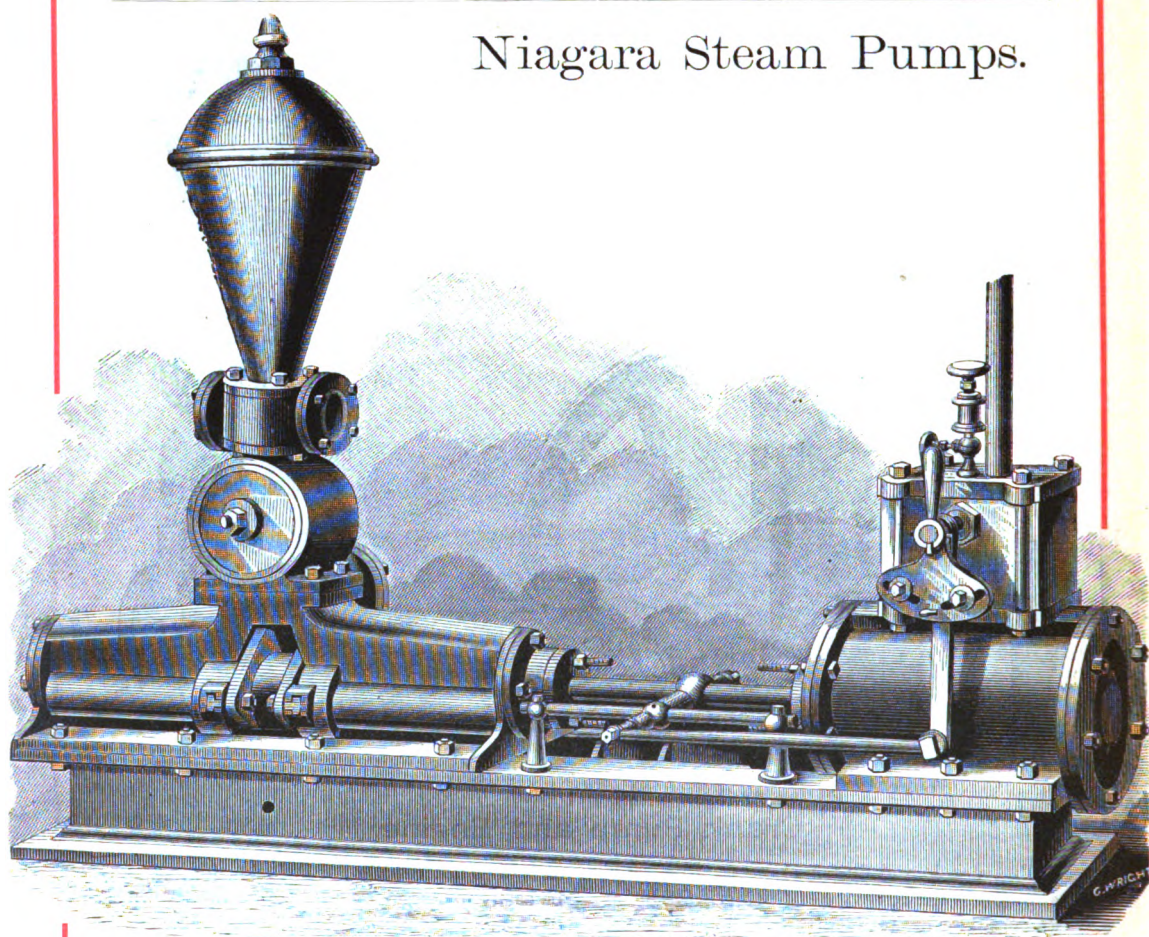
A hose kept ready makes it instantly available in case of fire. First moments being always the most valuable in such emergencies, it is for that purpose particularly effective, on account of the great speed it can be run at and the quantity of water it will throw.

In these and in the Direct Acting Pumps, the Patent Water Valves are so arranged as to be easily taken out, cleaned and replaced in the shortest possible time; the bonnet to the valve chamber being held by a single nut.

Both steam and water pistons are fitted with Metallic Ring Packing, thereby rendering them equally adapted to pumping hot or cold liquids; but hemp packing may be used instead, in case rings wear out or break.

| | | | | | | |
|---------------------------------|-------|-------|-------|-------|-------|-----|
| Size Number..... | 1 | 2 | 3 | 4 | 5 | 6 |
| Diameter of Steam Cylinder..... | 4 | 5 | 7 | 9 | 12 | 14 |
| Diameter of Water Cylinder..... | 2 | 2½ | 3½ | 5 | 7 | 8 |
| Length of Stroke..... | 4 | 5 | 6 | 7 | 8 | 10 |
| Revolutions per Minute..... | 200 | 180 | 160 | 110 | 100 | 95 |
| Gallons per Minute..... | 20 | 40 | 80 | 135 | 250 | 348 |
| Price | \$225 | \$300 | \$400 | \$550 | \$650 | \$ |

Niagara Steam Pumps.



Direct Double-Acting Plunger Pump.

THE plunger pump has the advantage of having no piston rings or interior packing to be looked after, the only packing being in stuffing boxes easily accessible. The plunger is on the end of the piston rod, and works into two chambers through large stuffing boxes between. It is particularly advantageous for pumping water containing grit or sediment, and specially useful in mining operations.

For heavy duty in mines these pumps are particularly fitted, as they are specially designed to work on heavy lifts, and to pump thick and turbid water, even when strongly impregnated with gas, oil, or acid. They are much used for working in quarries, pumping out wells, hydraulic mining, and for keeping foundations clear of water while being laid, also for pumping quicksand and water mixed with sand, mud, etc.

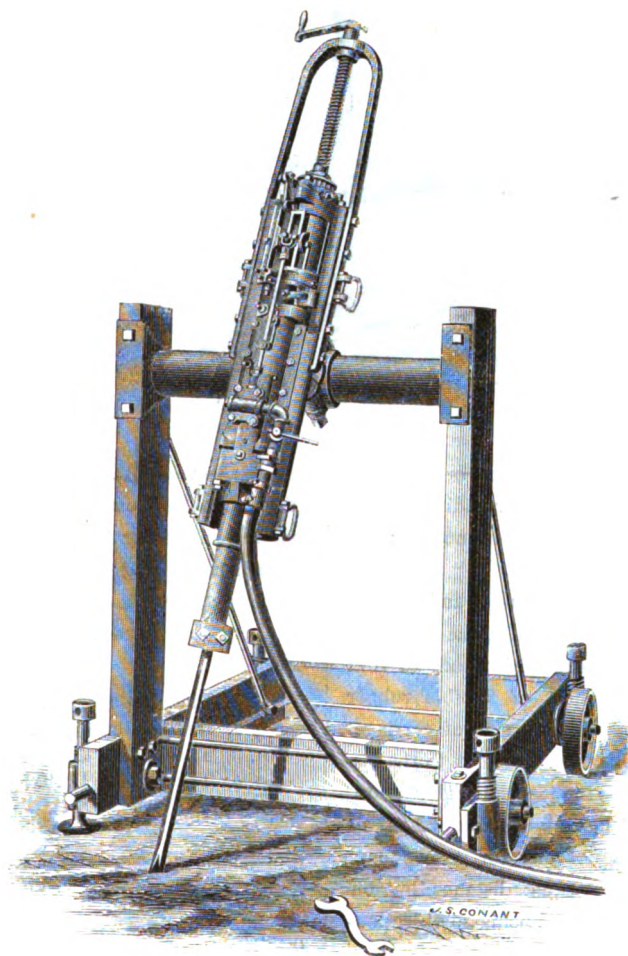
Wherever used, these pumps have given en-

tire satisfaction, doing the work imposed thoroughly and effectively, without breakdowns or other troubles incident to the employment of pumps improperly constructed.

Customers writing for information in regard to these pumps, will save much time and unnecessary correspondence by definitely stating the purpose to which pumps are to be applied; the nature of the liquid to be pumped—if salt, fresh, clear, or gritty, and if hot or cold; the distance liquid has to be drawn and forced, as well as height of suction and pressure pipes; the maximum or greatest quantity of fluid to be pumped, and pressure of steam to be used for the purpose.

Sizes and prices are not given for the reason that the various duties, circumstances, and conditions necessitate corresponding variations in dimensions and material of the various parts.

The Burleigh Rock Drill.

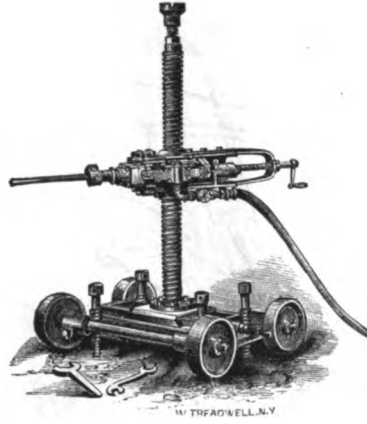


The main elements of a rock drill are the cage, the cylinder, and the piston. The cage is merely a trough, with ways on each side, in which the cylinder, by means of a feed-screw and an automatic feed-lever, is moved forward as the drill cuts away the rock. The piston moves back and forth in the cylinder, propelled and operated either by steam or compressed air, like the piston of an ordinary steam engine. The drill point is attached to the end of the piston rod—a solid bar of steel—and by an ingenious and simple mechanism it is slightly turned or rotated every time it moves back and forth.

The drill as above described is mounted, either on a tripod with adjustable telescopic or screw legs; on a tunnel carriage, with wheels for track or surface of ground, or on a screw post or column, with a jack screw at one end for screwing it in any position where the shaft or tunnel is low or narrow enough to admit of its use.

It is sometimes desirable in quarrying marble to avoid blasting and split it out squarely instead of breaking it up irregularly. To do this, holes two inches in diameter are drilled in a row two inches apart, and the connection between them broken down by throwing off

The Burleigh Rock Drill.



the rotation and using flat bar, or steel, instead of the drill point. The rapidity of this operation is a surprise to experienced quarry men.

For the open air steam is used, and may be supplied by any form of boiler, the steam being conveyed to the drills by means of iron pipes, with short lengths of flexible rubber tubes, to allow easy adjustment of carriage. The nearer the boiler can be kept to the machine, the less will be the loss by condensation.

For tunnel work and mining, compressed air is greatly preferred, not only for its economy in carrying power any great distance, but on account of a steam exhaust being so objectionable in a heading.

These machines are applicable to all kinds of rock work, whether mining, quarrying, cutting, tunneling, or submarine drilling. They combine simplicity, strength, lightness, and compactness; are easily handled and require but few repairs. Holes from three-fourths of an inch to five inches in diameter can be drilled to a depth not exceeding thirty or thirty-five feet, and from two to ten inches per minute, according to the nature of the rock.

The improvements in the details of these machines have reduced the expense of repairs to a very small item, a large portion of this being on the automatic feeding device, which has been discarded on the smaller sizes of

drills. A machine to go into the hands of unskilled laborers should be as simple as possible, therefore, anything smaller than a tunnel drill is for hand feeding, unless otherwise ordered.

The special work each rock drill is best fitted for, may be inferred from the names given below:

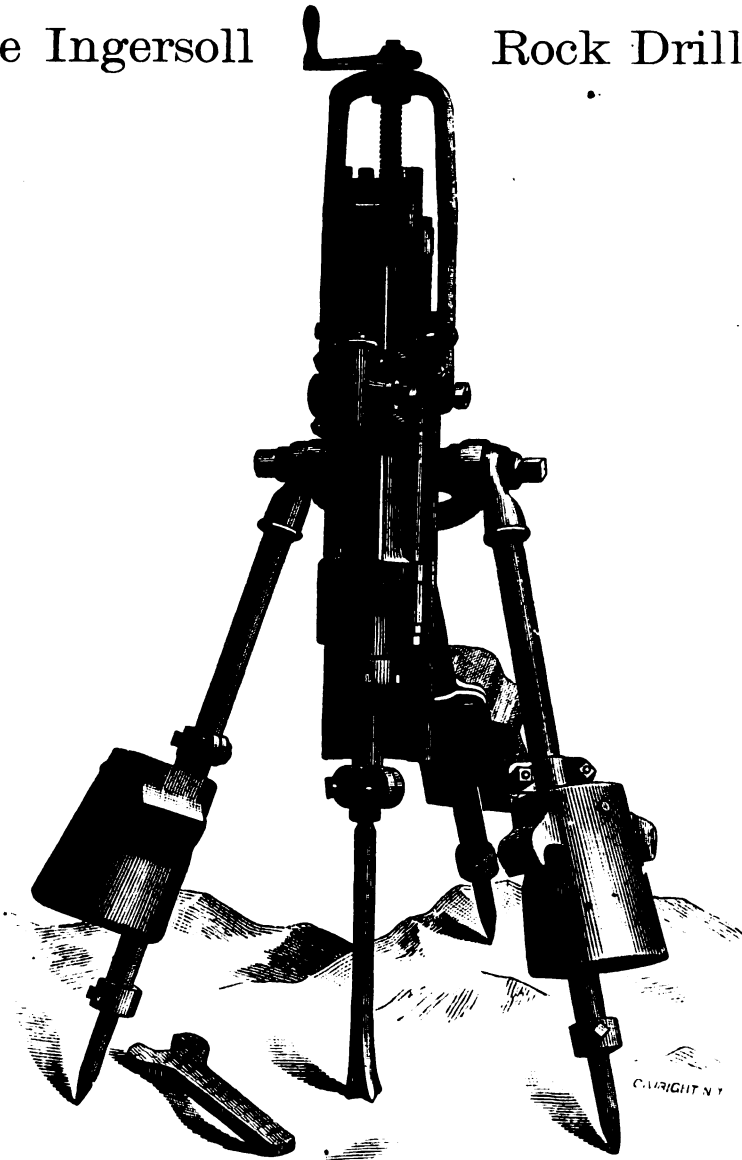
- No. 1, The Stoper Drill.
- No. 2, Intermediate Drill.
- No. 3, The Mining Drill.
- No. 4, The Tunnel Drill.
- No. 5, The Sewer Drill.

| Drill Number..... | 1 | 2 | 3 | 4 | 5 |
|-------------------------|-------|-------|-------|-------|-------|
| <i>Cylinder.</i> | | | | | |
| Diameter in Inches..... | 3¼ | 3¼ | 3¾ | 4¾ | 4¾ |
| Stroke..... | 6 | 6¾ | 7 | 7 | 9½ |
| <i>Drill Hole.</i> | | | | | |
| Diameter..... | 1 | 1¼ | 1¼ | 1¼ | 1½ |
| Depth in Feet..... | 12½ | 14 | 16 | 20 | 30 |
| <i>Drilling Engine.</i> | | | | | |
| Feed in Inches..... | 24 | 28 | 25 | 40 | 44 |
| Horse Power..... | 3 | 3½ | 4 | 5 | 7 |
| Weight in Pounds..... | 237 | 320 | 340 | 650 | 800 |
| Price..... | \$300 | \$360 | \$400 | \$500 | \$500 |
| <i>Tripod.</i> | | | | | |
| Weight..... | 400 | 500 | 450 | 550 | 600 |
| Price..... | \$70 | \$80 | \$100 | \$100 | \$100 |
| <i>Clamps.</i> | | | | | |
| Weight..... | 50 | 60 | 95 | 95 | 105 |
| Price..... | \$27 | \$30 | \$30 | \$30 | \$30 |
| <i>Heavy Columns.</i> | | | | | |
| Weight..... | 214 | 225 | 330 | 330 | 350 |
| Price..... | \$90 | \$90 | \$100 | \$100 | .. |
| Additional Feet..... | \$8 | \$8 | \$8 | \$8 | .. |
| <i>Light Columns.</i> | | | | | |
| Weight..... | 65 | 75 | 85 | 90 | 275 |
| Price..... | \$2 | \$3 | \$3 | \$3 | \$125 |
| <i>Carriage.</i> | | | | | |
| Size..... | .. | .. | 7 x 7 | 7 x 8 | 8 x 9 |
| Weight..... | .. | .. | 4500 | 5000 | 5700 |
| Price..... | .. | .. | \$475 | \$500 | \$525 |

- a Universal Weighted Legs.
- b Six Feet long, with Screw outside.
- c " " " Plain.
- d " " " with Swinging Arm.
- e For Two Drills.

The Ingersoll

Rock Drill.



THE best drills are those of recent invention and modern construction, being made from new patterns and by improved methods. A rock drill, combining the essential qualities of a practical machine, should possess the following features:

Durability, so as to save expense, both for repairs and for loss of time from breakage.

Simplicity, so that any ordinary workman can operate the machine efficiently.

Lightness, so the drill can be easily handled and carried about, which is extremely essential in mines.

Adjustability, so that the machine can be easily placed in position on uneven ground or in cramped places.

These features are all not only desirable, but eminently necessary to produce a perfect

machine, and in the above drill they have been successfully combined.

The Improved Ingersoll "Eclipse" Rock Drill is the most simple, economical, durable, and effective, being the only drill made with an independent valve. It has few parts, and no tappets to constantly wear out and break, and has but two quick-moving parts—the piston and the valve.

These drills are made principally of steel, to combine strength with lightness, and are made in duplicate with parts interchangeable: Parts to fit shipped promptly on receipt of order.

The two largest sizes are supplied with the patent automatic feed, which produces a regular and effective advance of the drilling bit as the rock is cut away. The others are made to be fed by hand, unless otherwise ordered.

The Ingersoll Rock Drill.



Improved Tunnel and Drifting Column, complete, with adjustable arm, for 2½, 3 and 3½ inch drills; weight, 190 lbs. \$ 80.00
 For 4 and 5 inch drills, 220 lbs. 120.00
 Tripod, complete, for 2½, 3 and 3½ inch drills. 45.00
 For 4 and 5 inch drills 55.00
 Plain Shaft Column, complete, with screw and clamp, for 2½, 3 and 3½ inch drills; weight, 170 lbs. 60.00
 For 4 and 5 inch drills; weight, 190 lbs. 94.00
 Adjustable Quarry Frame, for vertical or horizontal gadding, quarrying dimension stone, etc. 90.00
 Rubber Hose, marline wrapped, 5 ply, ¾ inch inside diameter, for 2½ and 3 inch drills, per foot.70
 1 inch inside, for 3½, 4 and 5 inch drills, .90

Ingersoll Hose Coupling, ¾ inch. \$ 1.75
 " " " 1 " 2.00

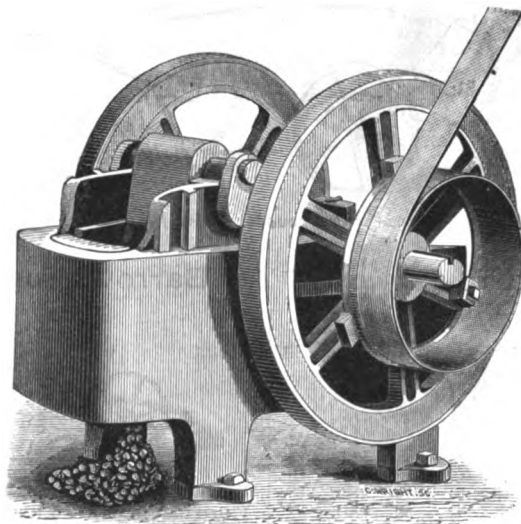
Turning Heads and Forging Bits on steel, for 2½, 3 and 3½ inch drills, each Head and Bit.50
 For 4 and 5 inch drill75

| <i>Machine.</i> | | * | 2½ | 3 | 3½ | 4 | 5 |
|------------------------|-------|-------|-------|-------|-------|---|---|
| Diameter of Cylinder | 3 | 4 | 5 | 6 | 7 | | |
| Stroke of Piston | 14 | 22 | 24 | 30 | 38 | | |
| Length of Feed | | | | | | | |
| <i>Holes Drilled.</i> | | | | | | | |
| Diameter of Largest | 5½ | 1 | 1½ | 2 | 3 | | |
| " Smallest | 1½ | 2 | 2½ | 4 | 6 | | |
| Depth Practicable | 3 | 8 | 12 | 20 | 40 | | |
| <i>Drill Complete.</i> | | | | | | | |
| Length of Machine | 24 | 36 | 42 | 60 | 60 | | |
| Weight | 100 | 200 | 275 | 472 | 558 | | |
| " Tripod | 100 | 100 | 125 | 245 | 260 | | |
| <i>Price.</i> | | | | | | | |
| Mounted on Tripod | \$250 | \$300 | \$350 | \$405 | \$455 | | |
| " Column | 285 | 335 | 385 | 470 | 530 | | |

* Only suitable for drilling plug and feather, and for black holes.

Ore and Rock Crushers.

(BLAKE PATTERN.)



THE breaking and crushing of large masses of ore and rock is now generally effected by means of a machine specially constructed for that purpose, made with extremely strong and heavy iron frame and jaw, worked by powerful leverage and eccentric motion. The shaft which operates this has two very heavy fly wheels, one on each side of the crusher, and a wide pulley to receive power by leather or rubber belt.

Stones and masses of ore are broken and crushed when dropped between the jaws, one of which is constantly in vibration by the mechanism described above. The stationary and moving jaws converge in such a way that the pieces of stone, as they are broken up, drop lower and lower in the wedge-shaped space, until sufficiently reduced in size to fall out below.

Machines like that illustrated on this page are in active operation in various parts of the

world, and are especially liked on the Pacific coast in both North and South America. They are built for the rough and heavy work usually required of them in the mining regions. Great care is used in their construction, and in the quality of the material used. Every machine is tested before leaving the works, and may be relied upon to do its work thoroughly and effectively.

We are now prepared to take orders for and manufacture the following sizes, dimensions given being the receiving capacity of the machine.

| Width, 10 inches. | | Depth, 4 inches. | |
|-------------------|---|------------------|---|
| " 10 " | " | " 7 " | " |
| " 15 " | " | " 9 " | " |

Larger, smaller or special sizes to suit all kinds of work can be made to order; parties having need of a crusher had better write particulars of work to be done and get our estimate.

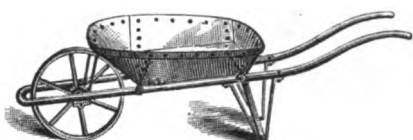
Tubular Wheel Barrows.

Two-Wheel Barrow.



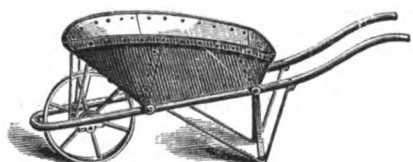
Capacity, 500 pounds. Price, \$38.00.

Dirt Barrows.



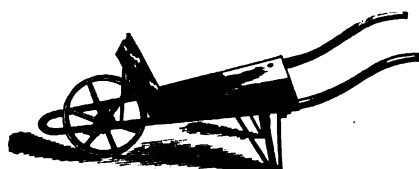
| | | | | |
|-------------------------------|---------|---------|---------|---------|
| Grade of Iron, Number | 16. | 14 | 14 | 14 |
| Capacity of Barrow, cubic ft. | 3 | 3 | 4 | 5 |
| Weight of Barrow, Pounds. | 65 | 70 | 80 | 85 |
| Lifting Weight, " | 20 | 22 | 21 | 22 |
| Reduced Price | \$10.75 | \$11.50 | \$18.50 | \$15.00 |

Coal Barrows.

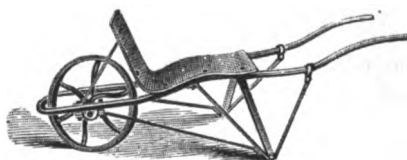


| | | | | |
|-----------------------------|---------|---------|---------|---------|
| Capacity of Barrow, Pounds | 325 | 400 | 260 | 300 |
| Width of Tray, Inches | 30 | 36 | 25 | .. |
| Weight of Barrow, Pounds. | 135 | 145 | 135 | 98 |
| Lifting Weight, " | 28 | 36 | 31 | .. |
| Reduced Price | \$26.00 | \$29.00 | \$26.00 | \$18.00 |

Barrows for Pig Metal.



Weight of Barrow, 78 lbs.; Price.....\$16.00
Fitted to receive Wooden Sides 17.50



With Convex Bottom \$30.00

Coke Barrow.

Capacity of Barrow, 4 bushels; Weight, 126 pounds.
Price, \$28.00.

THESE Barrows are made entirely of metal, the frame and handles being of iron tubing, while the trays, braces and wheels are wrought iron. This secures a combination of great strength, durability and comparative lightness. They are manufactured in the best and most complete manner possible, and should any part become lost, broken or worn out, it can at once be duplicated. As long as they are kept well painted, no rusting or corrosion will take place.

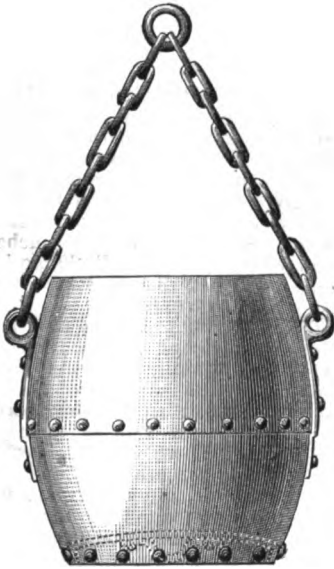
In any line of business where a wheel barrow is required, these barrows will be found to be superior in construction, convenience and ultimate economy, to any other manufactured;

and we unhesitatingly recommend their use in factory, store, warehouse, on shipboard, for railroad work, in garden, in park, on the farm, or on contract work, and especially for use in mining and milling operations.

For mining operations, we have barrows made stronger by extra stay braces to support and strengthen the frame, at an additional cost of seventy-five cents above prices charged for dirt barrows.

The coke barrow is expressly designed for carrying coke, charcoal, or other light material, and is not intended for coal—the tray being of light sheet iron and of large capacity.

Cornish Kibble.



THE best form of mining bucket for use in the sinking of vertical shafts is undoubtedly the Cornish Kibble, which is made as shown in the cut. The body of the kibble is made of boiler plate, with strong lugs riveted on each side, and a strong, reliable chain ball for hoisting. On the bottom, which is concave, a becket is riveted for dumping purposes.

We furnish these kibbles of any size and shape required.

Coaling Tub.



WE illustrate a superior coaling tub with patent side lock, and rollers on front and bottom. It is made of boiler plate strongly riveted, with wrought iron band to strengthen the rim. Special sizes of any capacity, for horse or steam power made to order.

| | |
|--|---------|
| No. 1, holding 1-8 of a Ton, each..... | \$30.00 |
| 2, " 1-6 " " | 82.50 |
| 3, " 1-5 " " | 85.00 |
| 4, " 1-4 " " | 40.00 |
| 4, " 1-4 of a Ton, heavy, each | 45.00 |

Drifting and Mining Picks.



| | | |
|----------------------|-----------|---------|
| No. 1, 3 pounds..... | per doz., | \$13.00 |
| 2, 4 " | " | 14.00 |
| 3, 4½ " | " | 15.00 |
| 4, 5 " | " | 16.00 |



| | | |
|------------------------|-----------|---------|
| No. 1, 8½ pounds | per doz., | \$18.00 |
| 2, 4 " | " | 14.00 |
| 3, 4½ " | " | 14.50 |
| 4, 5 " | " | 15.00 |

Mining Shovels—D or Long Handles.



| | |
|--|---------|
| Griffiths' Steel Mining Shovels, Round Points, No. 5,..... | \$13.00 |
| " " " " " " 6, | 18.50 |
| Steel Trimmers, Round Points, No. 6,..... | 18.50 |
| Lane's Steel Mining Shovels, Round Points, No. 6, | 13.00 |

Free Amalgamation in the Stamp Mill.

CLEANLINESS should always be a cardinal rule about amalgamating works, and in the use of the stamp mill it is of the first importance. No grease or oil must be allowed to drop into the mortars, or on the tables or aprons, as anything of that nature will materially interfere with the operation.

Cams are sometimes lubricated with soap or molasses in preference to grease. On another page we give a receipt for a composition lubricator for this part of the mill, which will not affect the amalgam if it accidentally gets into the mortars, and which experience has shown to be an excellent lubricator.

Care should be taken in using axle grease or other lubricator for the guides, only to put on a little at a time. The paste above-mentioned may be made softer by putting in less rosin and lamp black for this purpose.

Along with his other duties, the watchman has the special one of looking out for loose bolts and nuts; especially should those on the guides be kept from getting loose and falling off.

When tappets are set the stems should be marked with chalk, so that any slip may be at once detected, even before the unequal noise of the stamps draws attention to it. With the use of the modern steel shoes and dies, tappets need only be reset once a week.

The best way to reset tappets is to have five blocks cut the exact length of the required drop, and to put these under the stamps while setting the tappets on the stems to suit the cams. The keys must then be driven in hard, so as to secure a firm grip on the stem.

The drop of the stamp must, of course, be in accordance with the hardness of the mineral to be put through. Ordinary quartz of a saccharine or marbly structure requires to be set with a seven-inch block; softer, six inch; harder, eight or nine inches. More than this has been found to do but little more work, while it wears shoes and dies out faster, and consumes extra motive power—much more than the small increase in production justifies.

Increase of speed always pays when it is desired to run through large quantities of rock, but where the amount is limited speed should not exceed sixty drops per minute, as time must be given the gold to come in contact with the mercury, while fifty to fifty-five will be found to give more economical results.

The water feed must not be strong enough to wash and scour the plates when issuing from the mill, nor so slow as to allow it to become thick and turbid, and to lodge and settle on the plates. It should issue smoothly, and a little experience will soon teach how to regulate it for the different kinds of material put through, which varies so much as sometimes to make a hundred per cent difference in the flow of water required.

The best screens are those known as "hori-

zontal slot," with the burr left on and turned in; the slots being cut with a number six chisel, and each row cut alternate, so as to break joints as in brick work. This way of cutting makes them stronger and more durable, and gives a better discharge than where the slots are perpendicularly arranged over each other. From four to five inches in height and width of mortar discharge is sufficient; all over that causes screen to give out quicker and cost extra.

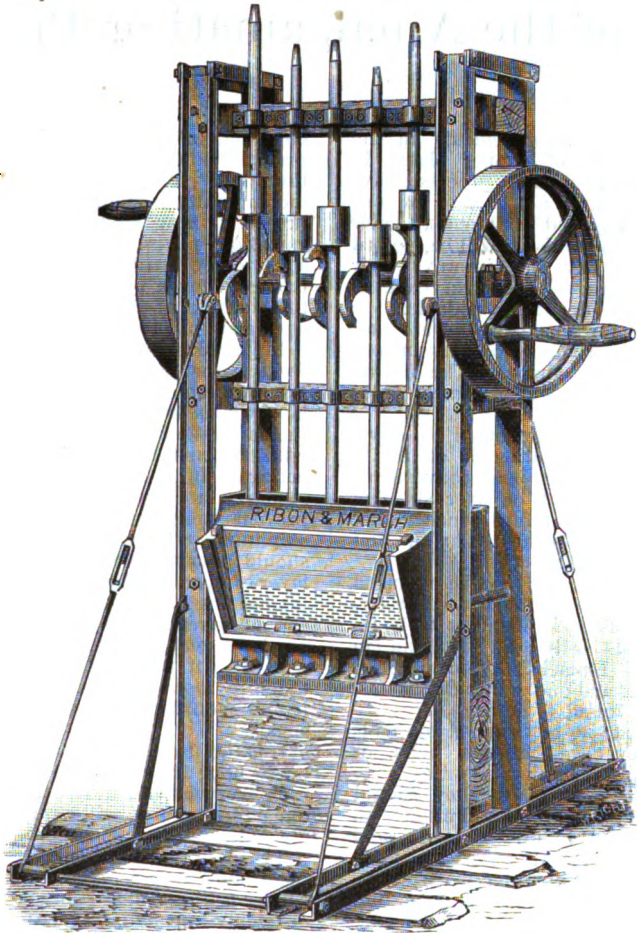
Breakdowns are apt to happen at any time, especially with mills of heavier than three hundred pound stamps, and the millman should see to it that supplies of all kinds, likely to be required, are at hand ready to use, and that tools are kept in their places when not in use. Shoes with their wooden slips tied on ready for use, slips and strings in plenty, strips of gunny bagging, tappet and cam keys, liners, duplicate screens and parts likely to break down or wear out.

Constant vigilance on the part of the watchman is imperatively demanded to guard against accidents of all kinds, as tappets will slip, cams work loose, shoes or heads drop off, stems break, or nuts get loose and drop off into the mortar, which will cause constant and vexatious delays in the work. A good millman is always known by his record of hours run in the week.

If a shoe drops off it should not take over ten minutes to hang up the five stamps of one battery, take out screen, replace shoe, and go on again. The same may be said in regard to a broken shoe or die, and it has often been done in half that time. A slipped tappet may be reset to its chalk mark without stopping the other four stamps, by simply hoisting up by Spanish windlass or by tackle, and adjusting it; but if a stem or cam breaks, or a cam gets loose, after half the week is out, it is better to hang defective stamp up out of the way of the other four until Sunday, unless it can evidently be replaced within an hour, as all the stamps working on that shaft must stop while this is being done. We here refer to the ordinary solid cams, but sectional cams (illustrated and described on another page) can be removed and adjusted in half an hour or less. If a screen bursts or gives out, hang up that battery and replace with duplicate screen; the old screen may then be repaired and put away until a like emergency requires another.

Dies may be used until worn down to the flange, and shoes may be worn to within an inch and a half of the head before renewing, unless broken before that. Steel shoes and dies rarely break, and wear down slowly; this wear lightens the stamp, but not enough to justify throwing aside if less worn than as stated above.

Prospecting California Stamp Mill.



"THE MOUNTAINEER."

THE above cut represents our Portable Prospecting Mill, with five stamps. It weighs but two-thousand pounds complete and ready for operation, without mortar block and mud sills.

It is put together with bolts and nuts, instead of rivets, and can readily be taken apart and transported anywhere on the backs of animals, the heaviest piece weighing about 420 lbs.

The mortar is made either for ordinary stamping and crushing, or (with flaring back and front ledges to support inside copper plates) for amalgamating within the battery.

It is mounted on a wrought-iron frame, and has two band balance wheels (30 inch by 8½ inch), arranged for hand, horse or other power.

All wearing parts, such as cams, tappets, heads, shoes, and dies, are made of the best cast steel and weigh as follows :

| | | | |
|------------------------------------|----------|------------------|---------------|
| Iron Frame, (in sections)..... | 600 lbs. | Cams..... | each, 20 lbs. |
| Mortar (feed, 24" x 1½")..... | 420 " | Stems..... | " 34 " |
| Cam Shaft..... | 40 " | Tappets..... | " 16 " |
| Fly Wheel Pulley, (30" x 3½") each | 180 " | Heads..... | " 32 " |
| | | Shoes..... | " 20 " |
| | | Dies, (4½" each) | " 20 " |

Though light and portable, it is capable of crushing from 250 to 300 lbs. of ordinary hard quartz rock per hour, on sixty 6" drops per minute, through a No. 6 slot screen.

Price, f. o. b. \$350

In ordering state which mortar is required.

Price of two ½" copper plates fitted, \$5.

For outside amalgamating table, ½ inch copper plate, cut and fitted to order, 81 cts. per lb.

In sheets, squared to order, 28 cts. per lb.

Small iron amalgamating pan with revolving copper fingers, suitable when dismounted for a clean-up pan; and 150 oz. retort, \$45.

For horse power and price see another page. Two-ply rubber belting, 3 inches wide, per foot, 20 cents. Single leather belting, 8 inches wide, per foot, 27 cents.

Rubber tubing, to conduct water to mortar of mill, ½" 16 cts. per ft.; ¾" 20 cts. per ft.

An ordinary barrel, set up near mill, with short pipe or tube to mortar, gauged by plug or compression, is suitable to furnish the water; it may be filled by hand or by one of the many pumps illustrated in this catalogue.

Use of the Amalgamating Plates.

Of late years the improvements in the manipulation and use of copper plates, in the free gold amalgamation process, have been considerable; and not a few of our patrons, who are engaged or intend to enter into active mining operations, will be pleased to see how easily they may improve their yield, simplify work, and correct troubles they heretofore considered unavoidable.

The best plates for amalgamation are previously annealed, and should be very smooth and soft on the upper surface. The outside plates should never be less than $\frac{1}{4}$ inch thick, and inside $\frac{1}{8}$ inch.

Outside plates are best arranged in a system of steps, at an inclination of at least 3 inches in 12 feet. For general convenience the first table should not be over six feet long, and the rest about thirty inches long and twelve or eighteen inches wide, the first plate being tapered to this width.

Any number of these steps can be arranged according to the fall available, and preferably in zig-zag shelves, so made as to be interchangeable and easily slid out and in for cleaning and replacing by duplicates. Six shelves in use and one or two duplicates, will generally be found to suffice.

Plates should never be fastened by nails or screws, but by cleats, clamps, bolts, or wedges, as circumstances may require.

To amalgamate new plates they should first be rapidly rubbed bright and clean with a woollen rag dipped in diluted nitric acid (one part acid to nine of water) and thoroughly washed off with water when clean. A strong solution of cyanide of potassium should then be applied with a woollen rag tied to a stick, and finished by applying prepared mercury in the same manner until the plates are thoroughly coated.

New mercury, fresh from the flask (never before used), should be prepared as follows: To a quart of dry mercury (if wet, dry with blotting paper) add five small chips of metallic sodium (chips about the size of those cut from lead pencil in repointing it), which should be dropped in as cut from the sodium ingot. These pieces will move about on the surface of the mercury as if alive, though, when somewhat tarnished, may need to be pushed under with a dry stick to cause them to combine with it. When the sodium is all dissolved and quiet, dip in and stir the mercury round a few times with the point of a new ten or eight-penny cut nail; if, on examination of the nail, the four corners are found to be slightly amalgamated, the quantity of sodium is correct; but if much amalgamated, clean mercury will have to be added to weaken it, until another nail shows just the four corners amalgamated and no more.

Next add five ounces of silver (previously

converted into filings, or dissolved in acid and precipitated on copper or by zinc); stir this in thoroughly, and give time to dissolve in the mercury; this is facilitated by slightly heating it. It is now ready to apply to the amalgamation plates, as before described; but squeezed or distilled mercury contains enough fine gold (even after retorting) to need only the addition of metallic sodium to make it equivalent to prepared mercury.

Prepared mercury is suitable to commence feeding the battery with until a supply of squeezed mercury is obtained; the latter must, however, be kept charged with sodium up to the nail test at all times, as is also the case with retorted mercury, which carries over enough gold in distilling to make the mercury sensitive in connection with the sodium, and prevents sickening and flouring in presence of sulphurets. The reserve of prepared mercury should always be kept covered with a thin layer of cyanide of potassium solution.

Charging mercury into the stamp battery should be regulated by the consistency of the amalgam on the outside plate near the discharge; if it feels harsh and crumbly to the touch, it requires more; if thin and slippery, less; it should feel about like moist Muscovado sugar.

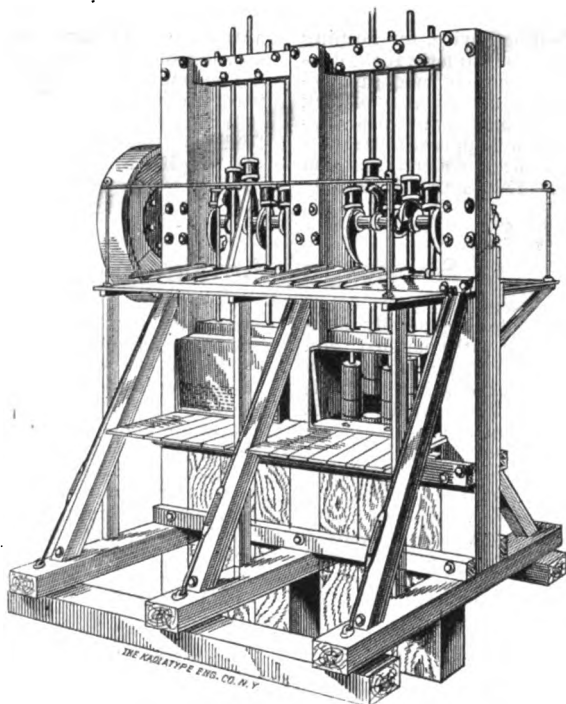
It is the usual custom to charge the battery every hour for ordinary rock, and for rich rock every half hour. A mineral containing one ounce per ton, will require the contents of a wooden mustard spoon put in every hour.

The first three or four feet of the outside plate should be scraped with a piece of old rubber belting (edges kept sharp) every twelve or twenty-four hours, according to the quality of the mineral put through; for one to two ounce material, when worked continuously, the latter will do. For inside plates twice a week is sufficient, unless over two ounce rock is going through.

The plates require "skinning" every three or six months, according to the quality of the material put through. The old manner of skinning with mallets or hammers is very objectionable, as with the utmost care the plates become dented and will no longer lay flat. It is better to remove them and treat as follows:

Burn bark to embers, or take hot embers from under the boiler grate, and have two persons pass each plate over the embers quickly and steadily, in small sections at a time of about three feet square; then place on mill table, or other flat surface with margin, and rapidly scrape with chisels or stiff palette knives, heating and scraping rapidly until completed. In this manner much amalgam is secured quarterly—not required on the plates, and while there is a loss of interest to the millman. After relaying the plates, rub with mercury to make them ready for use again.

California Stamping Mills.



350 Pounds Stamp Quartz Crushing Mill.

THIS cut represents our Light Weight Quartz Crushing Stamp Mill, the stem, tappet, head, and shoe, weighing together but three hundred and fifty pounds.

The mortar is made in four different styles, deep or shallow, and for amalgamation or not. Where easy transportation is an object it is made in sections, partly of wood lined with boiler plate iron, and cast-iron bottom. Single or double discharge, as ordered.

The above mill is furnished with Ribon's Patent Sectional Steel Cams, and the tappets, heads, shoes, and dies are made of cast steel, unless otherwise ordered; in which case a proportional discount will be made for difference in material.

We can furnish this mill with five, ten, fifteen, or twenty stamps on one shaft and pulley, according to the work required to be done.

All the necessary bolts for the frame and foundation are furnished with the mill, but the timbers must be supplied by purchasers, or specially ordered. They can be constructed and put together by any intelligent mechanic of ordinary skill, by simply following the

working plans furnished with these mills.

The weights of the various parts are as follows:

| | Lbs. |
|--------------------------------|------|
| Stem (9 ft. long, 1½ in.)..... | 72 |
| Tappet..... | 60 |
| Shoe..... | 100 |
| Head..... | 118 |
| Die..... | 110 |
| Mortar..... | 2000 |

At sixty, 7 inch drops per minute, each stamp will crush one ton of ordinary hard quartz every twenty-four hours through a No. 6 slot screen.

Iron mill frames of from 1000 to 1200 lbs. weight, made to order if desirable, for this or any other weight of stamp, and put together with bolts and nuts, so as to be readily set up and taken apart.

Price of a ten-stamp mill, as above described, without frame and foundation, \$1200.

Portable Chili Mills and Arrastrar will be made to order, but we do not recommend them as so effective for milling purposes as those of the California Pattern, even when working on a small scale.

Automatic Stamp Mill Feeder.

THE automatic feeding device, for keeping stamp batteries supplied with quartz rock, does its work in a simple, complete, and satisfactory manner. Whenever the quantity of rock being pulverized by the stamps diminishes below a certain amount, the hopper discharges a fresh supply into the mortar, which is repeated as occasion requires. This action is entirely

automatic, and saves wasteful loss of time, running stamps in empty mortars.

The hopper car may be run back out of the way, if it is desired to make repairs at the mill.

We are prepared to furnish these automatic feeders in three different styles and sizes, from \$80 to \$150 for each five stamps, or separate mortar.

Separating Amalgam.

AMALGAM from the plates is generally clean enough to simply moisten with mercury, and knead up into fifty ounce balls; but if much iron and sulphuret is present it should be treated as follows, which is also the treatment for amalgam derived from the mortar cleanings and plate skinings.

After washing in small lots in a gold pan and freeing from gravel and large pieces of iron, it is placed in a large wedge-wood mortar, an excess of mercury added and stirred with the fingers until the whole mass becomes fluid.

All foreign substances, such as gravel, iron,

sulphurets, etc., will rise to the surface, and may be skimmed off with a woolen rag wet with cyanide water, and carefully placed in another vessel for future treatment.

As soon as the surface remains clean, squeeze the whole mass through buckskin or canvas, the resulting ball left in the squeezing cloth is then ready for the retort.

Accumulated skimmings, to the fourth part of a retort full, may be put in a retort and distilled slowly; the resulting black looking product will be received and reduced at the mint or assay office, or can be reduced in a crucible with bi-carbonate of soda as a flux.

Retorting.

RETORTING pots should always be turned out smooth, both alembic and cap. Before using, the inside should be well rubbed with chalk; coating with moist ashes is bad for the iron, as the alkali is apt to honeycomb it.

The amalgam balls must be broken up before putting into the retorting pot; placed in loosely, not more than three-quarters full, two-thirds being better.

Ramming the amalgam hard and solid into the retorting pot, as some do, is not proper, as it requires longer to distill out the mercury, and leaves the heart of the retort piece rarely well done.

The flange of the retorting pot may be luted with moistened chalk or sifted ashes, which, when dry, can readily be brushed off. This is applied of the consistency of thick molasses, and the cap slightly turned when put on, to make sure of there being no grit or gravel in the luting. The retort is then keyed up and placed in the furnace. It should be at least six inches above the fire grate and be supported by an iron hoop fastened to three legs resting on the grate bars.

The hap-hazard manner of placing the end of the condensing pipe in the water should never be done, it is apt to result in explosions unless one is an expert at retorting. A canvas or rubber bag should be tied or screwed to the end of the condensing pipe and immersed in the water. When the mercury vapor begins to flow over the bag will swell up, this distension is a sign that

the mercury continues to come over; it is continually being condensed, and when the supply ceases the bag will collapse, indicating the completion of the operation.

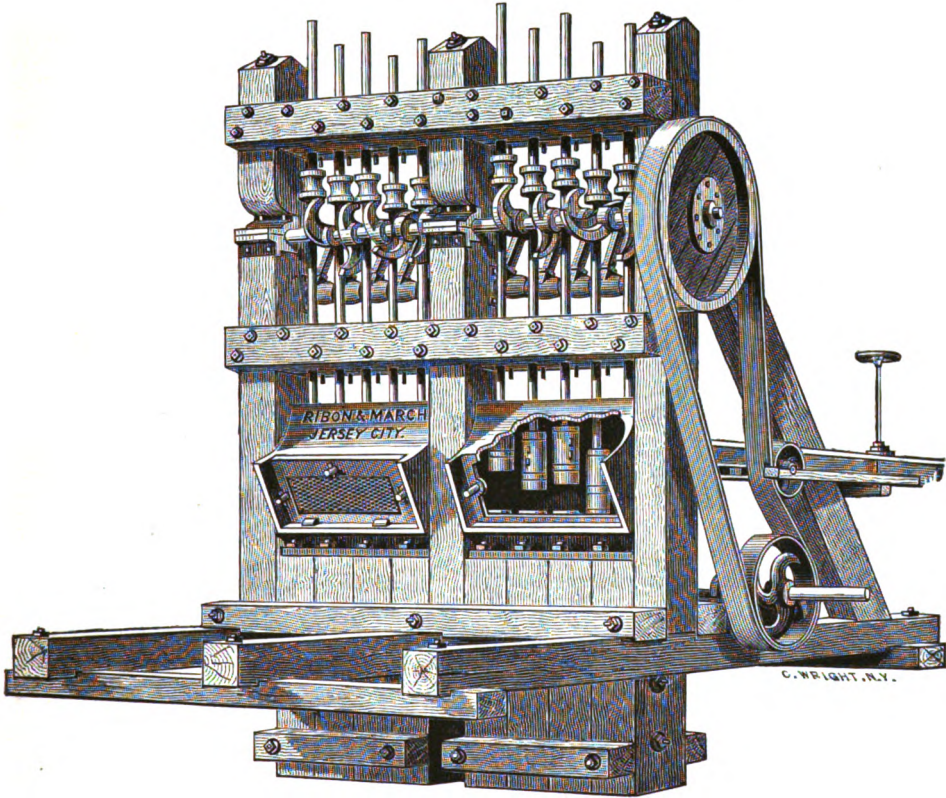
The condensing pipe, from the turn, down to the water, should be kept as cool as possible by continually pouring cold water over it. The best way, however, is to have a Leibig's condenser, illustrated on another page of our catalogue. It consists of a double tube, the inner one for the vapor to be condensed, and the outer for cold water, which enters below and makes its exit at the upper end of the tube.

Bark makes the best fire for retorting. It should be lit at the top and allowed to work down; when it reaches the grate put on more bark, and keep retort covered and all a bright red until bag begins to collapse, then put on last fire and leave until burnt out and cooled down to blackness.

After twenty or thirty minutes take off the bag, remove and dispose of the mercury, and lift out retort, but do not open for at least twenty minutes more. When open, turn over on a gold pan or other receiver, and if the result does not readily fall out a few light taps on the outside will dislodge it.

This retort metal is easily cut up with a hammer and chisel in pieces of about an ounce weight, and melted in a crucible without flux, as the bar will thereby be cleaner and finer; the resulting cinders can afterwards be melted with carbonate of soda and all saved.

California Stamping Mill.



Heavy Stamping Battery.

We here illustrate our heavy California Stamping Mill, built with ten stamps in one frame, and run with one shaft and pulley. Where purchasers desire two independent shafts and pulleys to run five stamps each, for extra heavy work, they can be so ordered.

The cams, tappets, heads, shoes, and dies are made of cast steel, unless otherwise ordered, in which case a proportional discount will be allowed.

Each stamp weighs 650 lbs., and consists of the following pieces:

| | Lbs. |
|---|------|
| Stem, 11 feet long, 2½ inches diameter..... | 250 |
| Tappet..... | 85 |
| Head..... | 196 |
| Shoe..... | 125 |

And the other parts of the mill weigh as follows:

| | Lbs. |
|-----------------|-------|
| Dies, each..... | 125 |
| Cams, "..... | 180 |
| Mortar..... | 8,000 |

It will crush and work through a No. 6 slot screen, every twenty-four hours, one and a half tons of ordinary quartz rock at sixty, 9-inch drops per minute for each stamp used.

Working plans for construction of frame furnished with each mill.

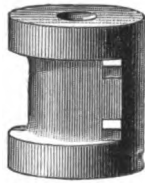
Price of ten-stamp mill, as above described, without frame and foundation, \$1700.

We also have patterns for a 450-lb. stamp mill, and are prepared to make to order any size above 650-lb. stamps.

Complete mill, with all the necessary power (including boiler, engine, pulleys, shafting, and belting), running from twenty to forty 650-lb. stamps, will average 9 cts. per pound. Mills above forty stamps, 8½ cts. per pound gross weight, which does not include erection. All wearing parts cast steel, with Ribon's Patent Sectional Steel Cam. In iron, with ordinary cams, less.

Tappets, Heads, Shoes, Dies and Cams.

A mill-owner who wishes to secure himself against frequent breakage, and the rapid wearing away of working parts, should have cams, tappets, heads, shoes and dies in his stamping mill made of cast steel, as the extra expense incurred at the start will be saved several times



TAPPET.

over before the mill has been running three months.

To meet the requirements of all customers, however, we cast these parts either of steel or iron, and of any dimension, shape or weight required. The following being our present schedule of prices; subject to rise or fall of material.

Tappets, turned and finished:

Steel.....per lb., 17½ cts.
Iron.....“ 11½ “



HEAD.

Stems:

Iron.....per lb., 8 cts.

Bosses or Heads:

Steel.....per lb., 11½ cts.
Iron.....“ 8 “

Dies and Shoes:

Steel.....per lb., 9½ cts.
Iron.....“ 6 “

Cams, Plain:

Steel.....“ 18 “
Iron.....“ 7½ “



SHOE.

Usual weights, finished and complete:

Tappets..... 85 lbs.
Stems.....250 “
Heads.....196 “
Shoes.....125 “
Dies.....125 “
Cams (single arm).....95 to 130 “
Cams (double arm).....120 to 165 “

Our tappets are fitted up with steel gibs and keys, so formed as to be less liable to slip than any other tappet in the market.

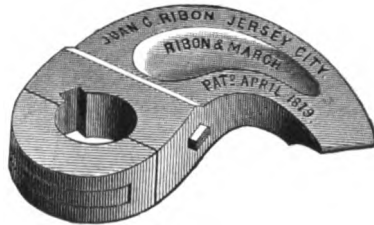
The bosses or heads we furnish are plain, as shown in cut, unless otherwise ordered. We also make them of iron, with wrought iron bands shrunk on, at top and bottom, if so required.



DIE.

Our plain cams, either single or double-armed, are flush on one side and have a hub on the other, with shrunk wrought-iron band. They are made right and left, and of any drop wanted.

Ribon's Patent Cam.



Patent Sectional Steel Cam.

THE above cam, single or double, is made in two pieces fastened together by a stirrup and key, both of which and the joint between the two sections are shown in our cut.

The difficulty of replacing a worn or broken cam of the old pattern, especially when located between journals or other cams, is well known to experienced millmen.

Our new cam, illustrated above, can be removed and replaced without necessitating the removal of the cam shaft from its bearings, or the shifting of any other cam or pulley on the shaft, thus obviating much hard and tedious hand labor, and saving

considerable time in operation of mill. A broken or worn out cam of this kind can be replaced in less than twenty minutes on any part of the shaft, and being made of the best cast steel will stand three times more wear and tear than a cast iron cam made on the old plan.

We make these cams of all sizes or drops. In ordering please state whether double or single arm, right or left hub is required, and send template of the same, or maximum drop required. Price, any drop or bore:

| | |
|---------------------|---------|
| Single Arm Cam..... | \$25.00 |
| Double Arm Cam..... | 32.00 |

Lubricator Paste for Cams.

THE operation described below should be carried on in the open air, away from any buildings or woods liable to catch fire, as the materials used may accidentally boil over and are very inflammable when hot.

Use a six or eight gallon pot and carefully heat the following ingredients over a small fire. In half a gallon of lard oil melt two pounds of tallow, then put in two pounds of beeswax, to which, when melted, add three pounds of rosin. When this has become liquid carefully sift in half-a-pound of lamp-black, stirring the mass with a stick until it is thoroughly incorporated. Remove the pot, or remove and put out fire, and continue stirring until the mass ceases to bubble, then slowly pour in half a gallon of Stockholm or pine tar (never coal tar) and keep stirring.

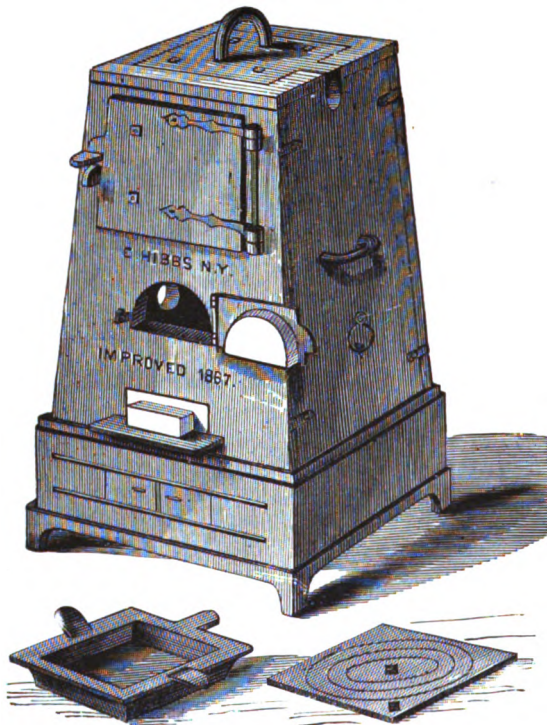
Be careful not to allow the mass to froth over, and stir the whole mass from the surface to the bottom.

The above quantity will be about enough to fill a dozen empty quart oyster or vegetable cans, which proceed to do while the paste is still liquid; it soon becomes hard and may be stored away for future use.

When cold, this paste is too hard to use; it is therefore necessary to keep a can of it on the steam chest of the engine or other warm place, and apply with a mop stick when the cams need lubricating; this will be indicated by the too rapid revolutions of the tappets.

The stems may be lubricated with a similar compound made softer by having less rosin and lampblack put in.

Hibbs' Improved Assay Furnace.



THIS furnace has a cast-iron frame lined with best fire brick, one-and-a-half inches in thickness. The dimensions of medium-sized furnaces are approximately as follows:

OUTSIDE.

Complete Height..... 31 in.
Base..... 17 by 13 in.
Top..... 12 by 12 in.

INSIDE.

From Grate to Top..... 19 in.
At Grate..... 9 by 12 in.
At Top..... 9 by 9 in.

* Muffle holes front and back to take muffles four inches wide by eleven inches long.

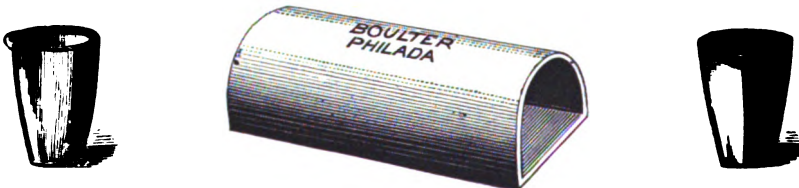
To fit top opening of furnace, it has a heavy fire-brick lined cover, a set of concentric rings, and an iron dish which can be used as a sand bath, all illustrated in the above cut.

The other sizes are made proportionately larger and smaller, as may be required, and can be had to work muffles from front or from both ends.

The price of this size of Assay Furnace is \$40.00.

Larger size, to take a five by eleven inch muffle, \$50.00.

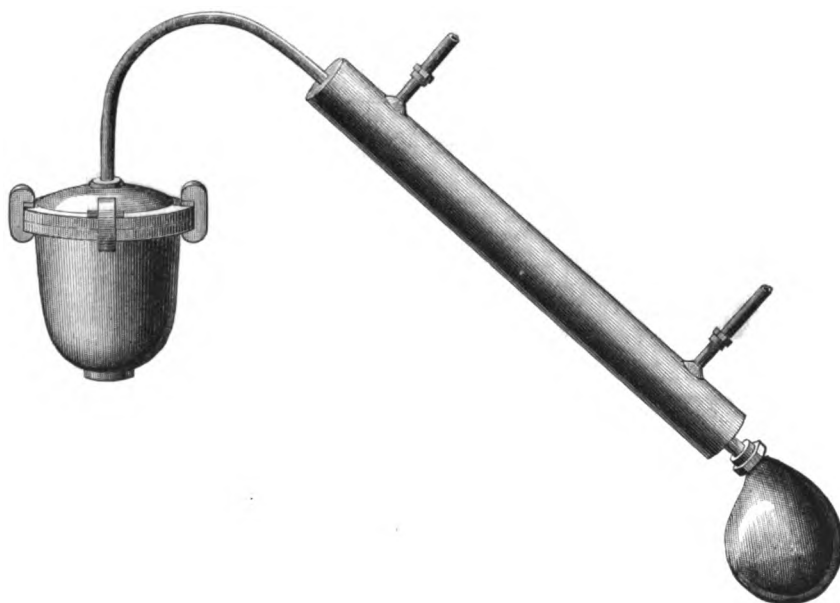
Smaller size, for four by eight inch muffle, \$30.00.



DIMENSIONS AND PRICES OF SAND OR HESSIAN CRUCIBLES.

| | TRIANGULAR. | | | | | | | ROUND. | | | | | | |
|---------------------|-------------|-----|-------|-------|-------|-------|-------|--------|-------|-------|-------|-------|--------|--------|
| Number in Nest.... | 3 | 3 | 3 | 5 | 6 | 7 | 7 | 2 | 3 | 4 | 4 | 5 | 5 | 6 |
| Height of Largest. | 3 | 4 | 4 1/4 | 4 1/2 | 5 1/4 | 6 1/4 | 8 | 4 | 4 1/4 | 5 1/4 | 6 1/4 | 7 | 10 1/4 | 12 1/4 |
| Width at Top..... | 2 3/4 | 3 | 3 1/4 | 3 3/4 | 4 1/2 | 6 | 6 1/4 | 3 | 3 1/4 | 4 1/4 | 6 | 5 1/4 | 7 1/4 | 9 |
| Price per Nest..... | .04 | .06 | .08 | .09 | .17 | .28 | .55 | .05 | .09 | .17 | .50 | .28 | .88 | \$1.65 |

Retorts, Condensers, Molds, Etc.



WE can make to order any size of the above style, or other shape of retort, smoothly turned on the inside, with covers warranted to fit.



To hold 150 ozs. amalgam.....\$5 00
 " " 250 " "12 00
 " " 500 " "20 00

To hold 1000 ozs. amalgam.....\$30 00
 " " 1500 " " 85 00

Liebig condenser and rubber bag fitted to retort, as above illustrated, \$10.00

Rubber hose of any length required:

$\frac{1}{2}$ inch in diameter, per foot.....16 cts.
 $\frac{3}{4}$ " " " "20 "

Ingot molds of any size, for gold or silver bars, are made with a slight taper (so ingot will readily fall out), and are finished smooth inside with round corners. They can also be lettered in bottom to order.

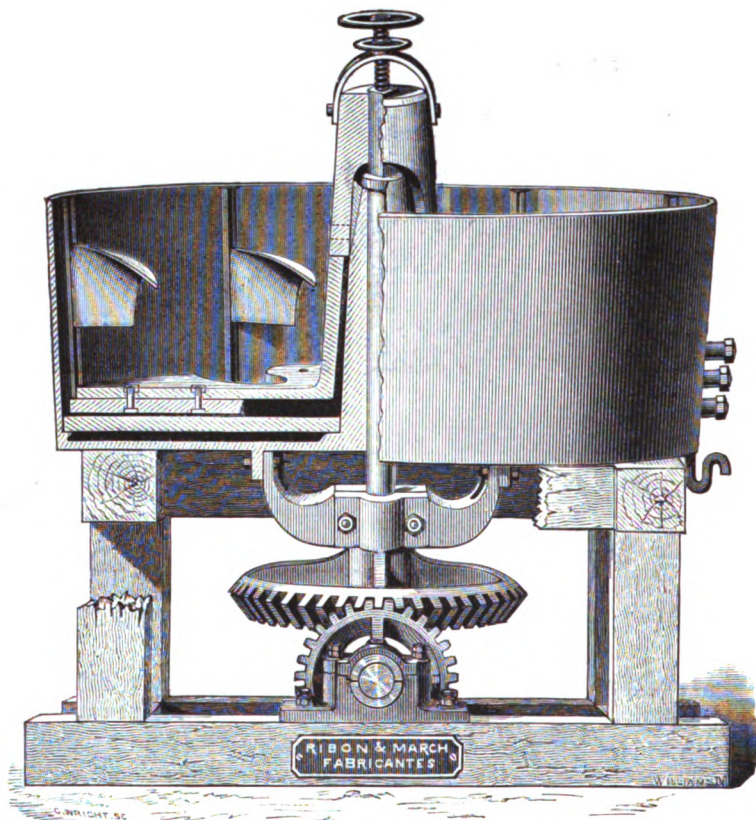
We also make adjustable molds for any shape bar desired, which can be set to hold from one to fifty ounces.

DIMENSIONS AND PRICES OF FRENCH CLAY MUFFLES.

| | | | | | | | | | | | | | |
|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|--------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Width..... | 3 $\frac{1}{4}$ | 3 $\frac{1}{4}$ | 3 $\frac{1}{4}$ | 3 $\frac{1}{4}$ | 4 | 4 | 4 | 4 $\frac{1}{4}$ | 4 $\frac{1}{4}$ | 4 $\frac{1}{4}$ | 5 | 5 | 5 |
| Length..... | 6 $\frac{1}{2}$ | 7 | 9 | 10 | 6 | 8 | 11 | 8 | 11 | 11 | 10 $\frac{1}{2}$ | 11 $\frac{1}{2}$ | 11 $\frac{1}{2}$ |
| Height..... | 2 $\frac{1}{4}$ | 2 $\frac{1}{4}$ | 2 $\frac{3}{4}$ | 2 $\frac{1}{4}$ | 2 $\frac{3}{4}$ | 2 $\frac{3}{4}$ | 3 | 3 | 3 $\frac{1}{4}$ | 3 | 4 | 4 | 3 $\frac{1}{4}$ |
| Price..... | .70 | .80 | .85 | .90 | .80 | .85 | \$1.00 | .85 | \$1.10 | \$1.25 | \$1.25 | \$1.50 | \$1.25 |

| | | | | | | | | | | | | |
|-------------|--------|--------|------------------|--------|--------|--------|--------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Width..... | 5 | 5 | 5 $\frac{1}{2}$ | 6 | 6 | 6 | 7 | 7 $\frac{1}{2}$ | 8 | 8 | 9 | 14 |
| Length..... | 14 | 16 | 11 $\frac{1}{4}$ | 9 | 10 | 12 | 14 | 7 | 12 | 14 | 15 | 18 |
| Height..... | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 $\frac{1}{4}$ | 4 $\frac{1}{4}$ | 5 $\frac{1}{4}$ | 7 $\frac{1}{2}$ |
| Price..... | \$1.50 | \$1.75 | \$1.50 | \$1.25 | \$1.50 | \$1.50 | \$2.00 | \$1.25 | \$1.85 | \$2.00 | \$2.75 | \$5.00 |

Milling Machinery.



Grinding and Amalgamating Pan.

THE above cut represents our Grinder and Amalgamating Pan.

The muller has six arms, with six steel shoes attached, running on a die consisting of part wood-on-end and part metal (or all metal if preferred), and radial grooves to catch quick-silver and amalgam, and conduct through tube to a lock-cup receiver on outside.

Beneath die is a steam space three inches in depth, by which the contents of pan may be heated to any required temperature short of the boiling point.

In grinding capacity, it is nearly equal to the best patent pan of same size and about half the price; while as an amalgamator, it is equal to any in the market. We therefore feel confidence in recommending it to the notice of our patrons and pan-users generally.

It is four feet, eight inches in diameter and eighteen inches in depth; it takes a charge of ten to twelve hundred pounds. It is erected on a timber frame. Each pan has its own clutch and lever for engaging or disengaging. It is manufactured from the very best material and finished in a first-class manner.

Weight complete, without frame, but including bevel gear, clutch lever, pulley, pillow block and shaft; 4000 pounds.

Parts.—Pan.....1600 lbs.
Muller..... 625 "
Die..... 825 "
Shoes, (each)..... 48 "

Steam pipe and connections ($\frac{3}{4}$ " pipe); water pipe (1 "), hose, nozzle, etc., extra to order.

Price.....\$850

In a line of two or more grinders, one set of pulleys and one line shaft is sufficient, with proportional reduction of first cost; also that of frame.

We can also make to order a continuous grinder, with inflow at the periphery and out-flow or discharge in center, this is for receiving and giving a preliminary grinding to discharge from stamp or other mills delivering a coarse product. Our experience in the use of this pan has been such that we do not recommend their use, deeming finer mill screens more economical and charging at once into the grinder and amalgamator, as above.

Milling Machinery.

SETTLERS.

THE Settler we make to use in connection with the Grinding and Amalgamating Pan, is six feet in diameter and eighteen inches deep. The mullers are steel, the sole has grooves to collect the quicksilver and conduct to a pipe at bottom connected with a mercury cup under lock on the outside of the pan.

This pan has no steam space below the sole, unless especially ordered; it is also set up on wooden frame similar to grinder, but with pan we furnish pulley, clutch and lever, pillow blocks, collars, shaft, bevel gear and spindle, complete, ready for use. Weight, complete, other, 4000 lbs.

Price.....\$400

Weight of parts :

| | |
|-------------------|-----------|
| Pan | 1775 lbs. |
| Hoop..... | 425 " |
| Muller..... | 850 " |
| Shoe (each) | 14 " |

Water pipe and sprinkler attachments of $\frac{1}{2}$ inch pipe, extra to order.

We make an agitator of seven feet, six inches in diameter and eighteen inches deep; similar to the settler, except that it has four surface wings and fingered arms, the bottom more concave and having its quicksilver receiver similar to the settler.

Arrangements of shoes in this pan grind up thoroughly any particles that may have escaped the shoes of the grinders or mullers of the settlers, and as a saver of quicksilver and amalgam, which otherwise would be lost without its use, will soon pay cost, room and power consumed.

PORTABLE MILLING MACHINERY.

In connection with our Portable Mill, the "Mountaineer," we have designed and now make a small grinder similar to the grinder we illustrate, excepting it has no steam space, unless especially ordered; as in prospecting

work steam boilers may not be available, and water can readily be heated in more simple manner and kept so without steam.

In all other respects this pan is same as the full-sized grinder, and will be found to be quite as efficient an amalgamator.

As now designed, this pan is twenty-four inches diameter and ten inches deep.

THE SETTLER.

The Settler, for using in connection with above, is thirty-six inches diameter and ten inches deep; complete in every detail and a perfect reduced size *fac simile* to our large size settlers.

Both are so constructed that no single piece in either exceeds two hundred pounds in weight. They are geared same as the large ones, and run from pulley by belt to any available power.

CONCENTRATORS.

For Sulphurets, the Hendy Concentrator still remains popular; but we can procure any other style in the market, to order, at the very lowest prices.

BUDDLES.

We make the regular Cornish Buddle concave, or convex, in wood or iron, and any diameter from six feet to eighteen feet, carefully numbered to facilitate erection when made of iron. The brushes in bristles, whalebone, rubber, or wire, to order.

JIGS

made of any style and size in wood or iron, to order.

Dolleys, Traps, Headers, Scrapers, Buddles or Handy Pan Automatic Feeders; Sand Sizers, of any capacity, made to order and shipped at shortest possible notice.

Sugar Cane Crushing Mills.

THE construction of the vertical mill for crushing sugar cane is not favorable to strength, steadiness nor compactness, and where a durable machine is required for severe and continuous work, we cannot recommend their use.

We illustrate a few sizes and styles of this machine, manufactured by us to meet the demands of some of our correspondents, who receive orders for light and portable mills to be used on small plantations in mountainous countries, where the transportation of heavy and cumbersome machinery is very costly and extremely difficult.

The only advantages we can mention of the vertical over the horizontal mill, are: that its several parts can be safely and securely packed in separate parcels, which facilitates ease of handling and transportation, especially in unsettled regions where it has to be carried on the backs of animals; and that, when this mill is to be worked by horse power, the power can be applied directly to one of the rollers without the interposition of beveled gearing, always necessary in the horizontal mill, where this addition implies complication of machinery and waste of power in friction of cogs and extra bearings.

The horizontal mill, on the other hand, is considerably heavier, and therefore less portable; but for crushing sugar cane it is far superior, as the cane will yield a greater per centage of juice, and will save the employment of an extra attendant to pass the half-crushed cane through the second rollers, they being arranged so as to carry the sugar cane direct from the first to the second crushing. It is more expensive, but being constructed to withstand greater pressure, and to do several times as much work, it will be found more economical in the end than the cheaper vertical mill before described.

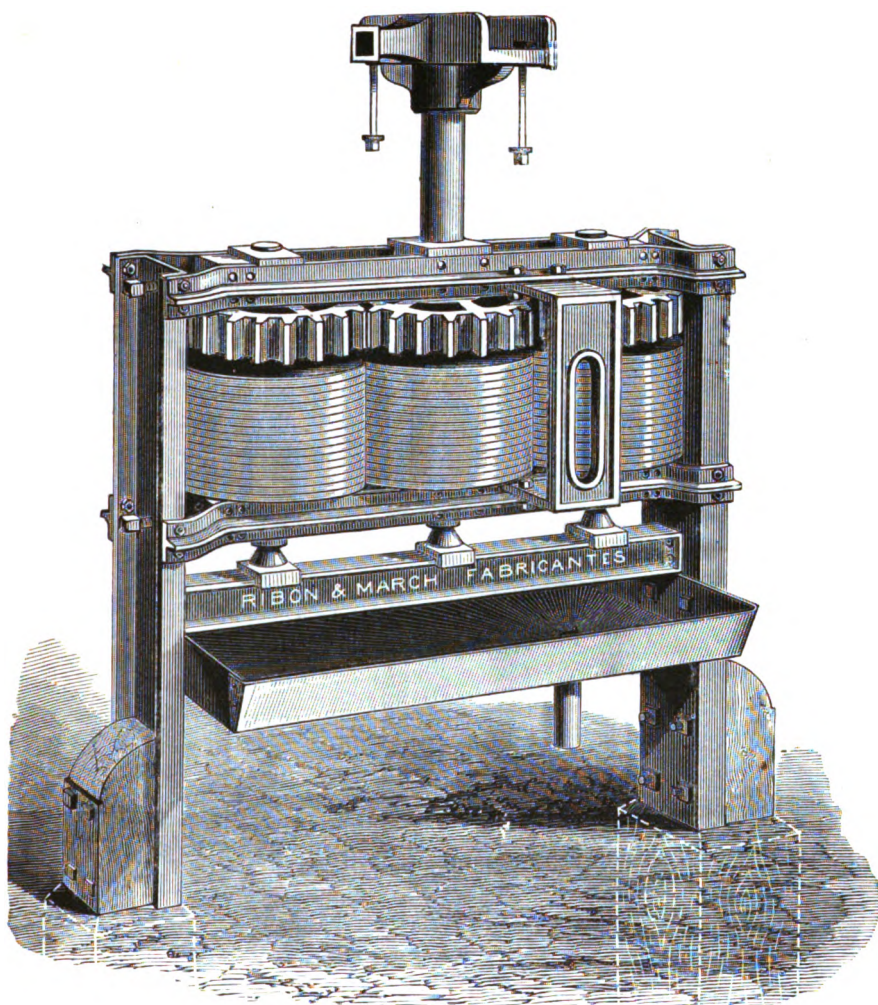
All our mills, horizontal as well as vertical, are made from material selected with great care, and the different parts are constructed by skilled workmen in the very best manner. In the first place the rollers are bored out and key-seated, the shafts are carefully turned, driven in very tight and keyed on, and the rollers are then turned off on their shafts and will consequently run true with each other and crush well. In many instances we have seen small sugar mills made with the rollers cast on the shafts; this is a bad practice, as the strength of the wrought iron shaft is materially impaired by the action of the heat and the absorption of the carbon from the melted iron during the operation of casting. As a natural result, the owner of a mill has to lose the whole roller in case of the breakage of a shaft, which cannot be removed and replaced by a new one, as can be done with our mills in case of an accident of this nature.

The bearings of our horizontal mills are made of the best composition, planed in their seats, bored out and very carefully fitted. The set screws for adjusting the rollers to the proper opening or distance, are made of steel and run in wrought iron nuts.

The two bottom rollers of our large horizontal mills, particularly when intended for steam or water power, are made with flanges at the ends, so as to keep the cane within the rollers. These mills are furnished with cane conductor and baggasse carrier, and will be made of any desired length.

The velocity with which the periphery of the rollers revolve should never exceed fifteen feet per minute; any speed greater than this is injurious to the mill, and will cause a great loss in the yield of the cane, as time must be allowed for the juice to free itself from the cane fibers, as it passes through the rollers.

Vertical Sugar Mill.



"The Condor."

WE have lately designed and constructed a Vertical Mill for crushing sugarcane, especially adapted for transportation over the mountains. The frame is constructed entirely of wrought iron, and is made in sections held together with bolts and nuts; parts not necessary to separate being firmly riveted.

It can be readily taken apart, securely and safely packed in separate parcels for shipment and easily put together; we therefore feel assured that when tried it will be found to be efficient and strong for the purpose intended, and we do not hesitate to recommend it as su-

perior to any other horse-power sugar mill built.

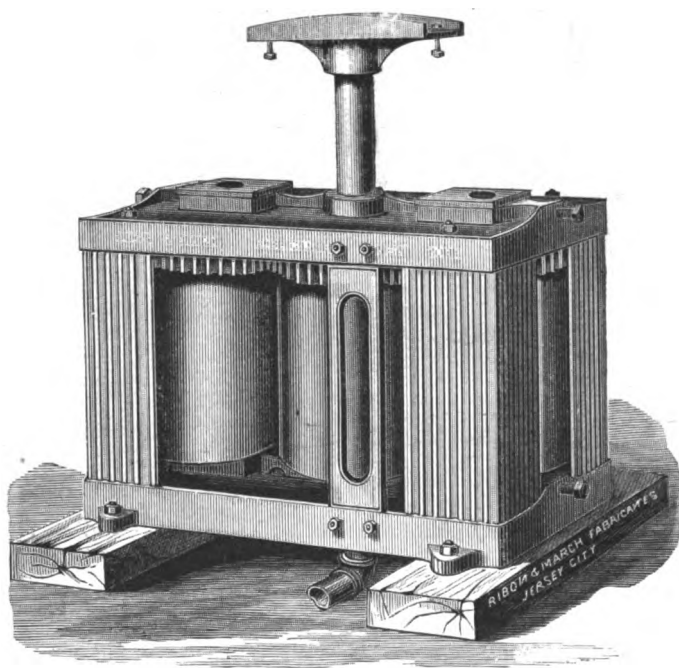
In order to save weight, the frame of this mill has been made with upright channels, which can be firmly and securely bolted to wooden posts and anchored in the ground, as shown in our illustration.

The rollers are fourteen inches in diameter and eight inches long, and with the shaft weigh about two-hundred pounds each; the other parts are all lighter and easy of transportation.

| | |
|---------------------|-----------|
| Total weight..... | 1500 lbs. |
| Price complete..... | \$175.00. |

Vertical Sugar Mill.

WITH IRON FRAME.



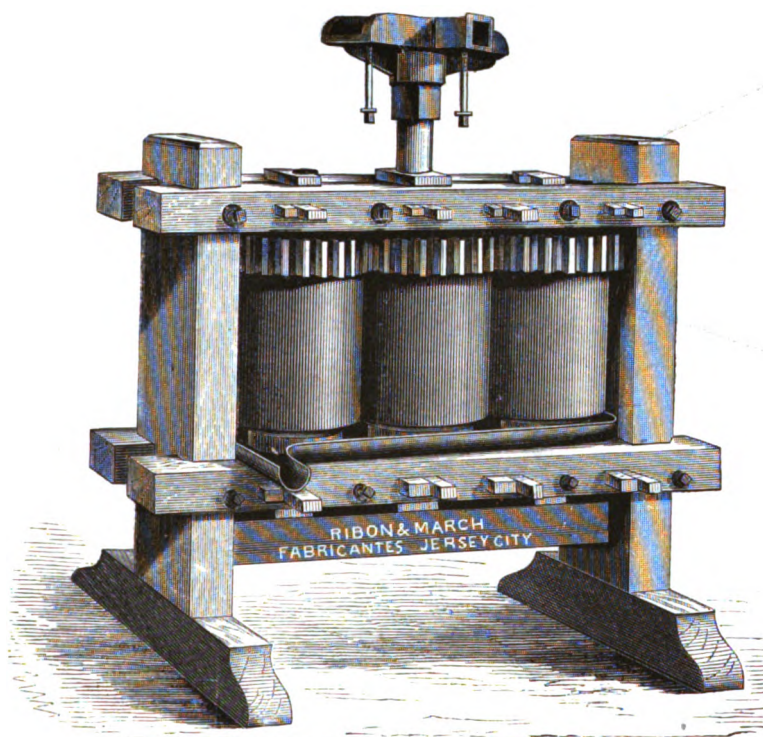
THE mill represented in the above cut is another style of our vertical mills, suitable for small plantations, and possesses the advantages of taking but little room, and of being put together easily and in a very short time. It requires a very simple foundation, formed by four posts anchored or buried in the ground, and capped with two pieces of timber morticed

over the posts. Sizes and weights of these mills—

| Size of Rollers. | | Weight of each Roller. | Weight of whole Mill. |
|------------------|---------|------------------------|-----------------------|
| Diameter. | Length. | | |
| 10 | 12 | 175 lbs. | 1400 lbs. |
| 12 | 14 | 250 " | 2000 " |
| 14½ | 16 | 375 " | 2800 " |
| 16 | 18 | 500 " | 3500 " |
| 18 | 20 | 700 " | 4400 " |

Vertical Sugar Mill.

WITH WOODEN FRAME.



THE mill we illustrate on this page is intended for the use of planters located where transportation on wagons over roads is practicable and available, as the rollers are rather too heavy to be carried on mules backs; also for small planters who are not able to purchase a mill with iron frame either vertical or horizontal.

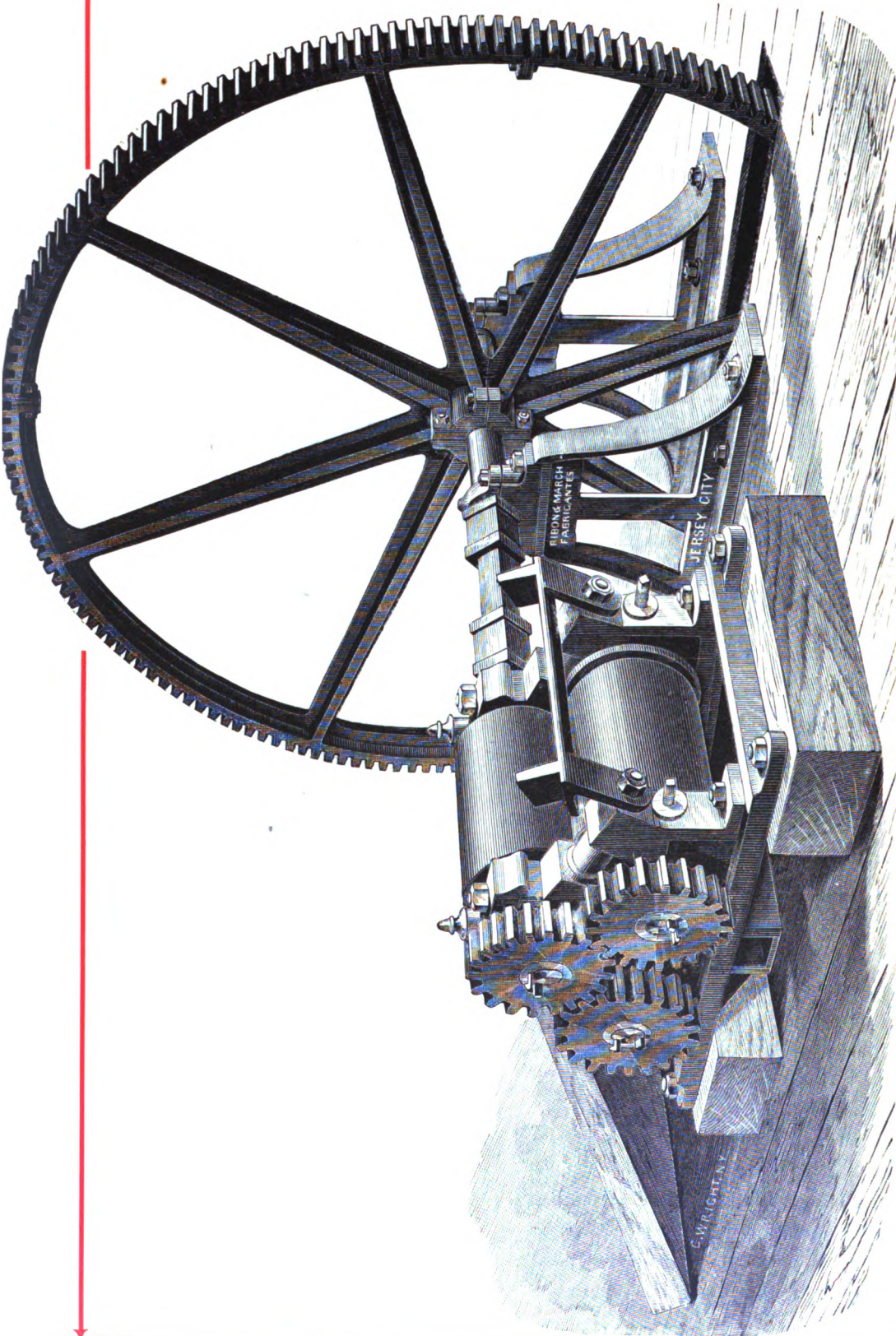
In offering this mill to our patrons, our idea is that the purchaser will make his own frame where the mill is to be used, as wherever sugar cane is cultivated hard wood timber can be easily and cheaply obtained; thereby saving freight and other expenses on

same. The construction of such a frame is so simple that any ordinary mechanic can easily make it.

The following are the pieces furnished for this mill:

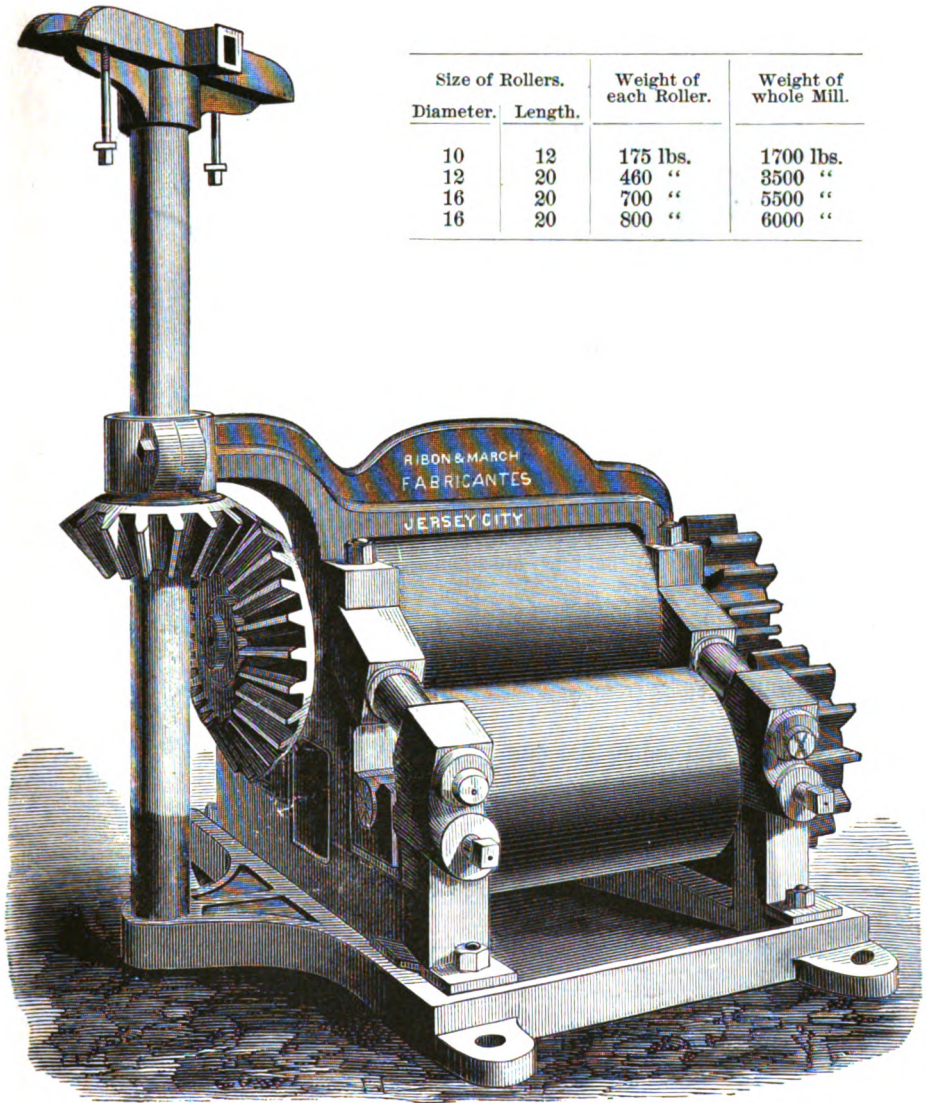
Three rollers with shaft and gears, lever-box with bolts, bearings for rollers, juice pan and bolts for frame.

| Size of Rollers. | | Weight of each Roller. | Weight of whole Mill. |
|------------------|---------|------------------------|-----------------------|
| Diameter. | Length. | | |
| 10 | 12 | 175 lbs. | 900 lbs. |
| 12 | 14 | 250 " | 1400 " |
| 14½ | 16 | 375 " | 1900 " |
| 16 | 18 | 500 " | 2100 " |
| 18 | 20 | 700 " | 2500 " |



Horizontal Sugar Mill, Manufactured by Ribon & March, Jersey City, U. S. A.

Horizontal Sugar Mill.



| Size of Rollers. | | Weight of each Roller. | Weight of whole Mill. |
|------------------|---------|---------------------------|--------------------------|
| Diameter. | Length. | | |
| 10 | 12 | 175 lbs. | 1700 lbs. |
| 12 | 20 | 460 " | 3500 " |
| 16 | 20 | 700 " | 5500 " |
| 16 | 20 | 800 " | 6000 " |

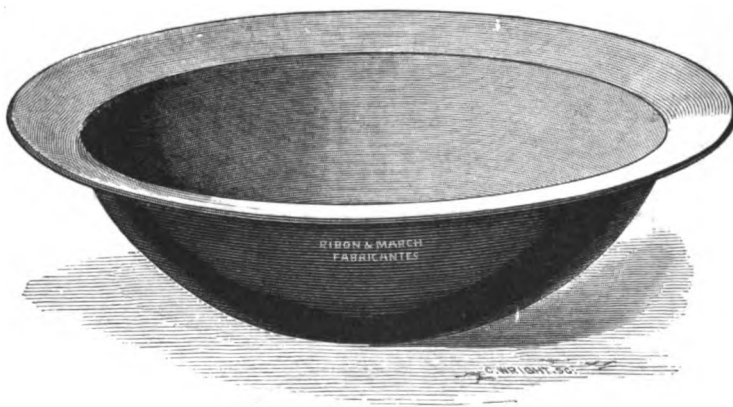
In these two pages we illustrate our Horizontal Sugar Mills, to be used with steam, water or horse power, to suit the wants of the purchaser; and when any peculiar feature may be needed to be adapted to locality or mere desire of the planter, we are ready to execute it, by giving us full descriptions of the plan to be carried out.

Above we give dimensions and weights of a few mills to be driven by horse power, but

will fill any order for intermediate sizes, or will alter dimensions if required; that is, will make the rollers shorter or longer.

In regard to mills, as per illustration on opposite page, to be driven by steam or water power, we are prepared to build any size with complete fixtures, including engine and boiler or water wheel, cane and baggase carriers, clarifiers, coolers, tanks, &c., &c.

Sugar Pans or Evaporators.



THESE pans we make of the best quality of iron, very heavy, with solid bottoms and smooth inside.

They are cast a third heavier and of a better quality of iron than any other pan manufactured, and will not crack from continued heating.

They are used for evaporating cane juice, maple syrup, glucose, etc.; for boiling soap and for melting wax, asphalt, and any materials

which require open, shallow pans with large heating surfaces.

The number of gallons capacity we give in the following table are the actual sizes of these pans, and the weights average seven pounds to the gallon.

We manufacture Kettles and Pans of any desired shape and size, either of cast iron, plate iron or copper, according to instructions from purchasers.

DIMENSIONS AND PRICES OF EVAPORATING PANS.

| Size..... | 15 | 20 | 25 | 30 | 40 | 50 | 60 | 80 | 100 | 125 | 150 | 200 | Gallons. |
|---------------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| Diameter..... | 30 | 31 | 34 | 36 | 40 | 42 | 45½ | 49½ | 53½ | 57½ | 61½ | 67½ | Inches. |
| Depth..... | 9 | 10½ | 11 | 12 | 13½ | 14 | 15½ | 16½ | 17½ | 19½ | 20½ | 22½ | Inches. |
| Rim..... | 2½ | 2½ | 2¾ | 3 | 3½ | 4½ | 4½ | 4½ | 4½ | 4½ | 5 | 5½ | Inches. |
| Price..... | 7.00 | 8.00 | 9.00 | 10.00 | 13.00 | 16.00 | 19.00 | 24.00 | 28.00 | 35.00 | 42.00 | 56.00 | \$ c. |

IMPROVED sugar refining machinery of all kinds may be ordered from us, with confidence on the part of our customers that only the best will be sent to them.

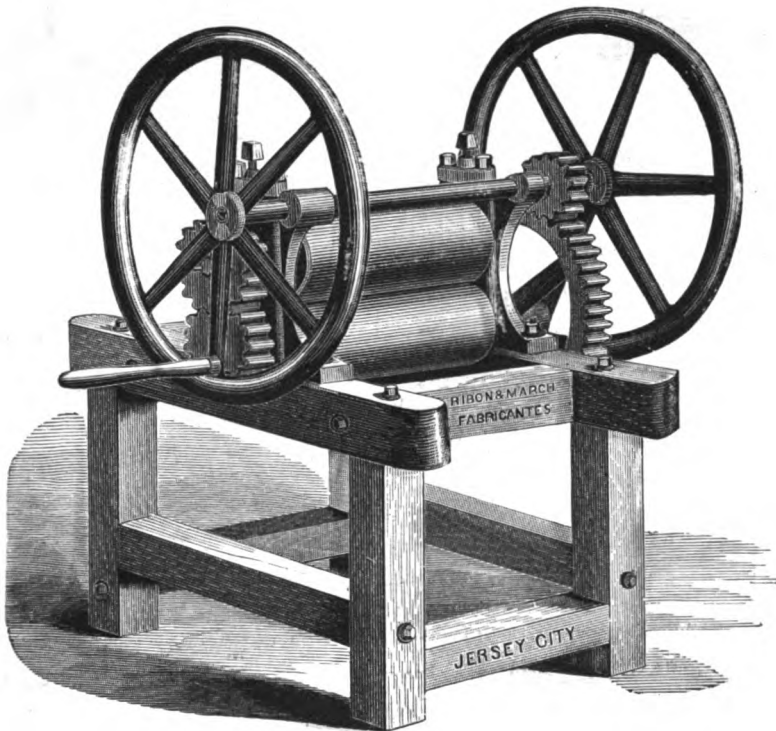
Planters will find the centrifugal machines manufactured by us to be simple in construction, not dangerous to use, and easily man-

aged; they are not likely to get out of order, can be readily repaired and work with efficiency, economy and satisfaction.

Mixers and other machinery we can supply of the best machinery and workmanship, at prices as low as those of any other manufacturer in the country.

Small Rubber Press.

PORTABLE.



THE above cut represents our small cylinder rubber press for expressing water from raw or green rubber in its primitive state, so that it will not deteriorate while in storage nor during transportation.

This machine, being simple in its construction, needs no explanation to enable any one to put it together properly, and to keep it in running order.

It is durably and substantially made, and its low price brings it within the reach of small dealers of the above product.

It can be driven by power or by hand, and for the latter purpose we furnish an extra

hand wheel instead of the pulley, so that the machine can be worked by two men.

The rollers or cylinders can be adjusted to any thickness of rubber it may be required to press, by simply turning the set screws on top of the bearings.

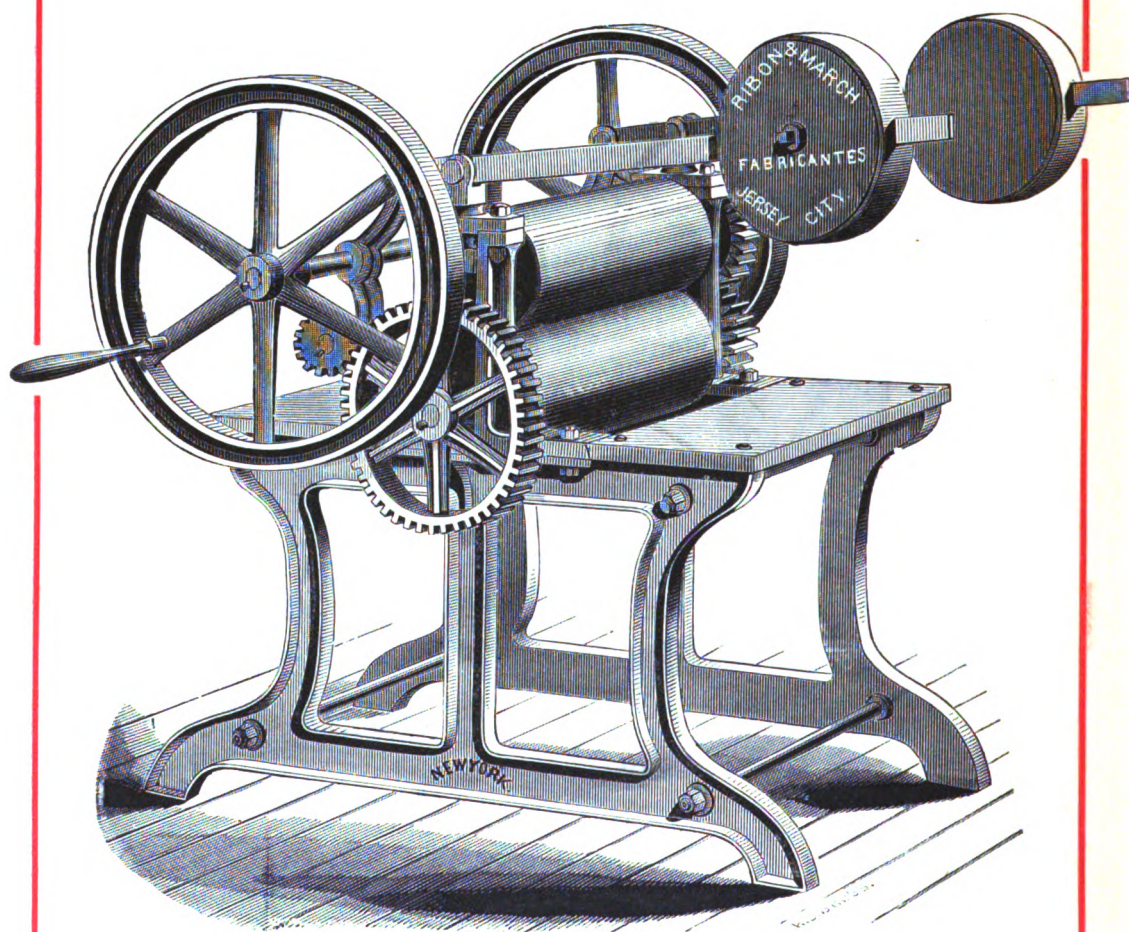
The cylinders measure eight inches in diameter by twenty inches long, and weigh two-hundred-and-twenty-two pounds each, being the heaviest pieces in the machine.

Total weight, 1180 lbs.

Price, including boxing in separate packages (to facilitate handling) and delivery on board ship, \$150.

Large Rubber Press.

IMPROVED PATTERN,



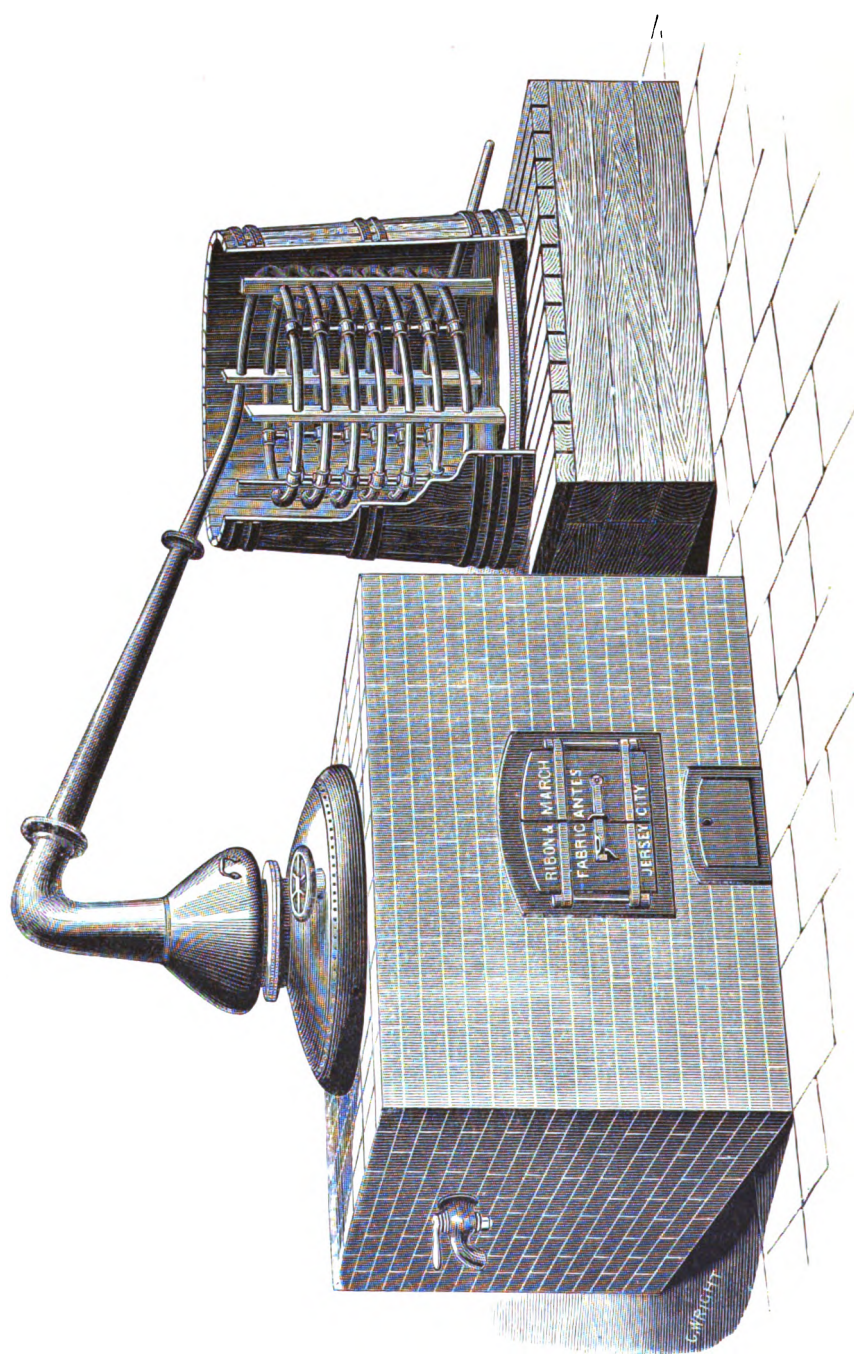
For parties extensively engaged in the rubber trade we manufacture a heavier and more complete machine, possessing advantages not found in the smaller press previously described.

The cylinders, being larger, allow more contact of surface with the rubber under pressure, and consequently operate more effectively. Two levers and weights act directly on the two ends of the upper roller shaft, and uneven

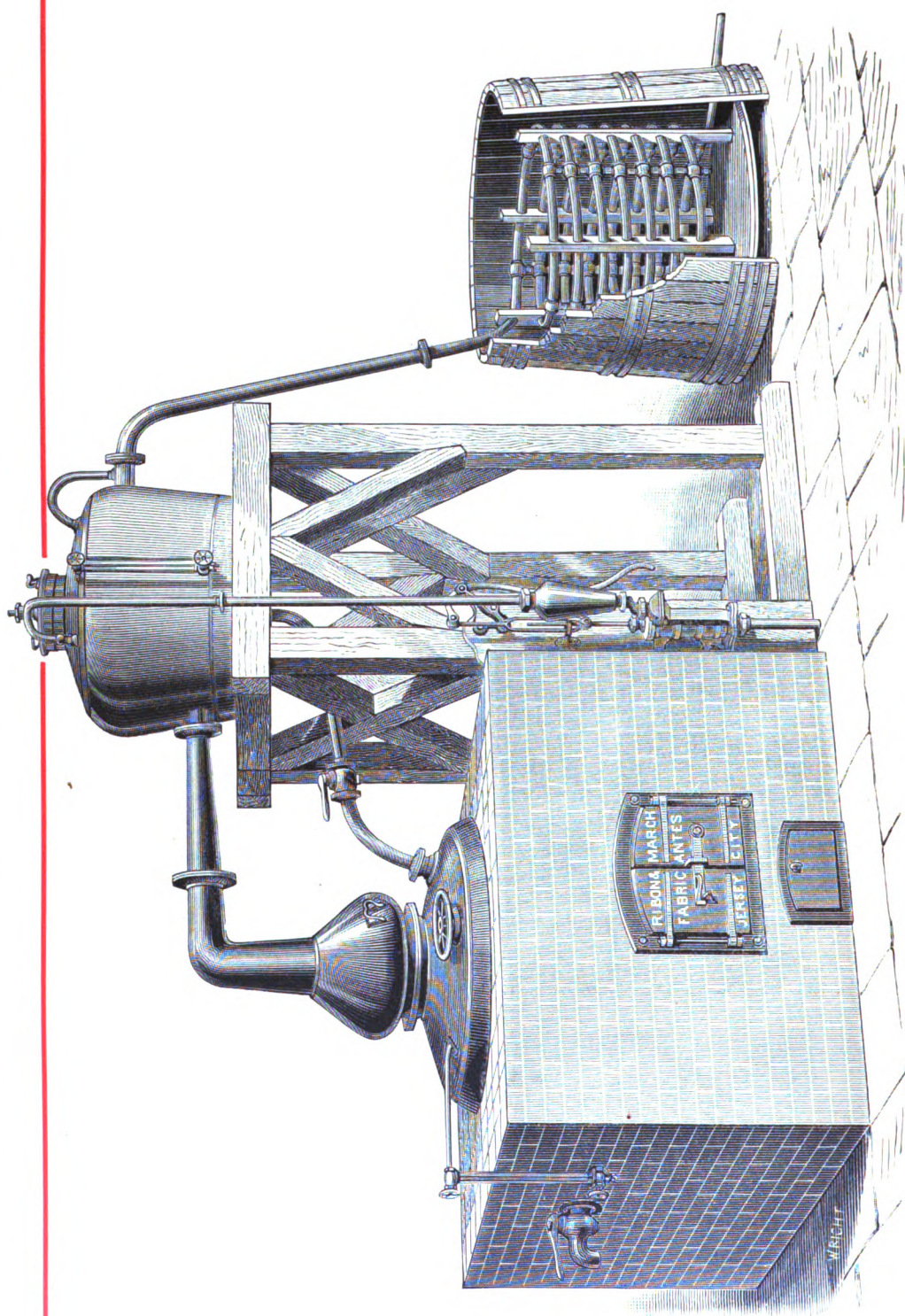
strips of rubber are pressed more uniformly, however unequal they may be, it therefore produces a better quality of rubber for exportation.

With the exception of the wooden table cover, this machine is all iron; and like the small press before described, may be driven by hand, horse, or steam power.

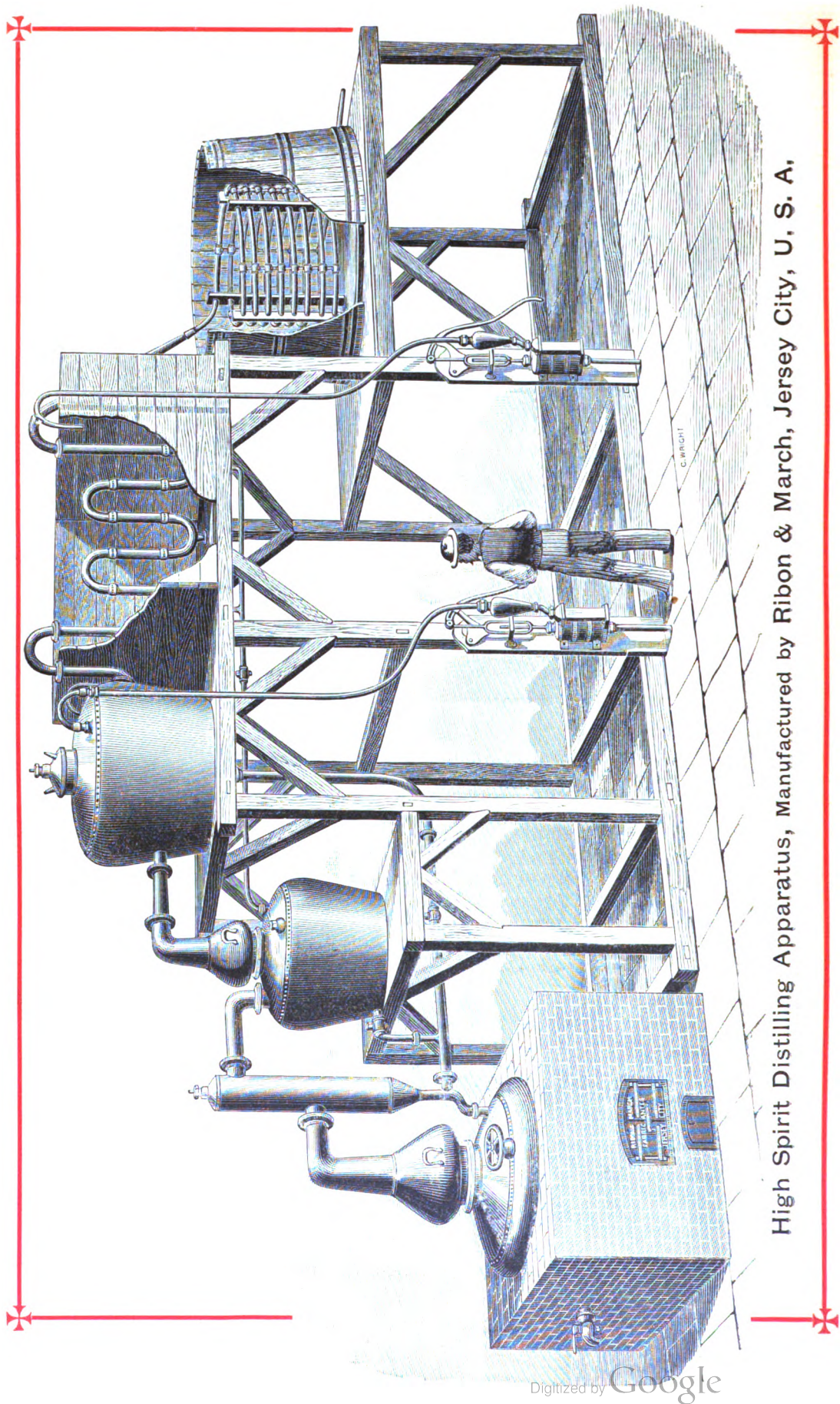
The weight is twenty-four-hundred pounds; and the price, including boxing and delivery on shipboard, \$400.



Copper Still and Condensing Worm, Manufactured by Ribon & March, Jersey City, U. S. A.



Copper Still, Heater and Condenser, Manufactured by Ribon & March, Jersey City, U. S. A.



High Spirit Distilling Apparatus, Manufactured by Ribon & March, Jersey City, U. S. A.

Copper Stills.

Still and Condenser.

WE illustrate three different styles of Copper Stills manufactured by us. They are constructed of the best material and in the most substantial manner, being first-class in every particular.

The first cut represents a still of the sim-

plest form, for the distillation of rum. It consists of the cucurbite, the capital or cap, the beak and the worm or condenser. This still will yield rum of 18° or 20° Cartier, provided the mash has been properly made and is in the required state of fermentation.

Still, Heater and Condenser.

The second illustration contains, in addition to the first, another vessel called the Heater; its functions being, as its name indicates, to heat the charge intended to be distilled in the following batch or operation; this is in order to save fuel and gain time in the yield of the apparatus, as one or two more batches can be

distilled every twelve hours. At the same time it prepares for condensation the alcoholic vapors, which pass through its interior coil, so that they are ready to be quickly and thoroughly condensed when they reach the worm. This apparatus will yield rum at 22° or 24° Cartier, when properly managed.

High Spirit Distilling Apparatus.

We also illustrate another apparatus for distilling high spirits, to which we attach a Doubler, intended for the purpose of depriving the alcoholic vapors of the impurities and foul flavors carried over in the vaporization; these are washed out and remain with the low wines contained in the doubler. This vessel has also the object of storing, temporarily, the low wines from the goose or check cylinder, as the case may be, until returned to the still for re-distillation.

A Goose, as shown in the cut, or a check cylinder, is added to the apparatus, in order to purify the spirits just before passing to the condenser, thereby obtaining a very high and clean spirit of about 30° Cartier.

A Safety Column is interposed between the still and the doubler for the purpose of preventing the mash from flowing over into the doubler, in case of violent ebullition caused by

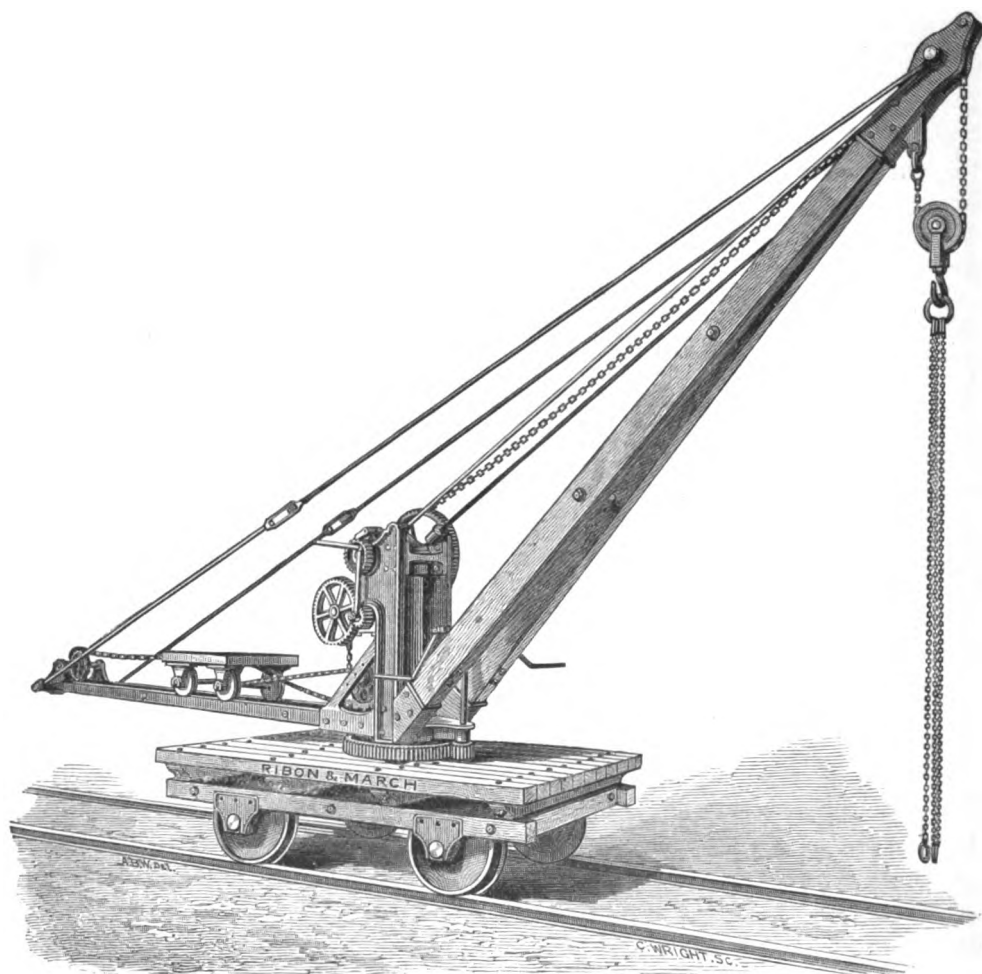
want of proper care on the part of the attendant; in such a contingency the overflowing mash will be returned into the still instead of passing through the whole apparatus, as would be the case without this appliance.

The charging screw and discharging stop cock are furnished with each of the three styles described. The cap is constructed so as to be readily taken off when it is desired to clean the cucurbite.

We manufacture any size desired, and are prepared to furnish price of the same on application.

The safety column, as well as the heater, is provided with an air valve; this prevents a vacuum being formed in any part of the apparatus, and any danger of collapse from external air pressure. When discharging the lees it is advisable to take off the cap of the charging screw on the shoulder of the still.

Revolving Portable Crane.



THE above cut illustrates our improved Portable or Traveling Crane. It is intended for lifting and moving heavy articles, is useful in mining, quarrying and manufacturing operations; or for loading railway cars and canal boats.

To counter-balance weights lifted by this machine, it is provided with a platform car, loaded with ballast, which can be adjusted to the proper distance on projecting track at the rear of the crane, as shown in cut.

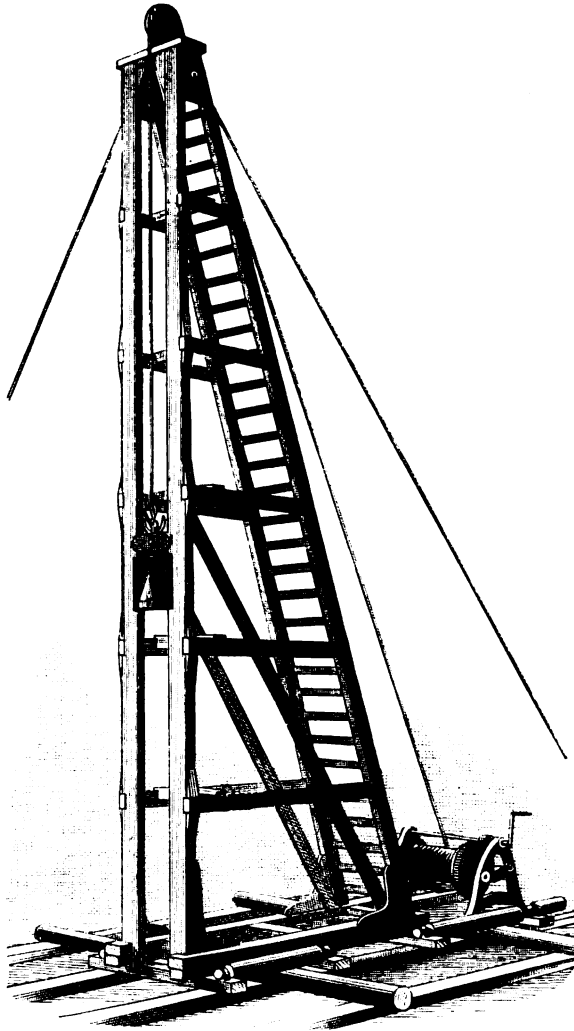
The hoisting arrangement has two cranks, which can be worked by two or four men, and

is geared for great lifting power. The swing of the crane is effected and controlled by spur-gearing shown in cut, so that weights remain under full control even when track is slightly inclined or out of level.

Every part of this machine is made in the very best manner and of the best material, specially proportioned for minimum of weight consistent with maximum of strength.

The car can be built for any gauge of track or width of tramway. Parties ordering will please state particulars of work to be done and heaviest weight required to be raised.

Pile Driver.



THE Pile Driver illustrated on this page is constructed of well-seasoned timber, and the different parts firmly secured with bolts and nuts. It can be shipped in easily handled parcels, and put together, ready for operation, in a short space of time, with little trouble. We construct them to be operated by hand, horse or steam power, a hoisting engine and boiler (illustrated and described on another page) being attached to the frame. This arrange-

ment is more economical where a great number of piles are to be driven; and necessary if rapid work is required to be done.

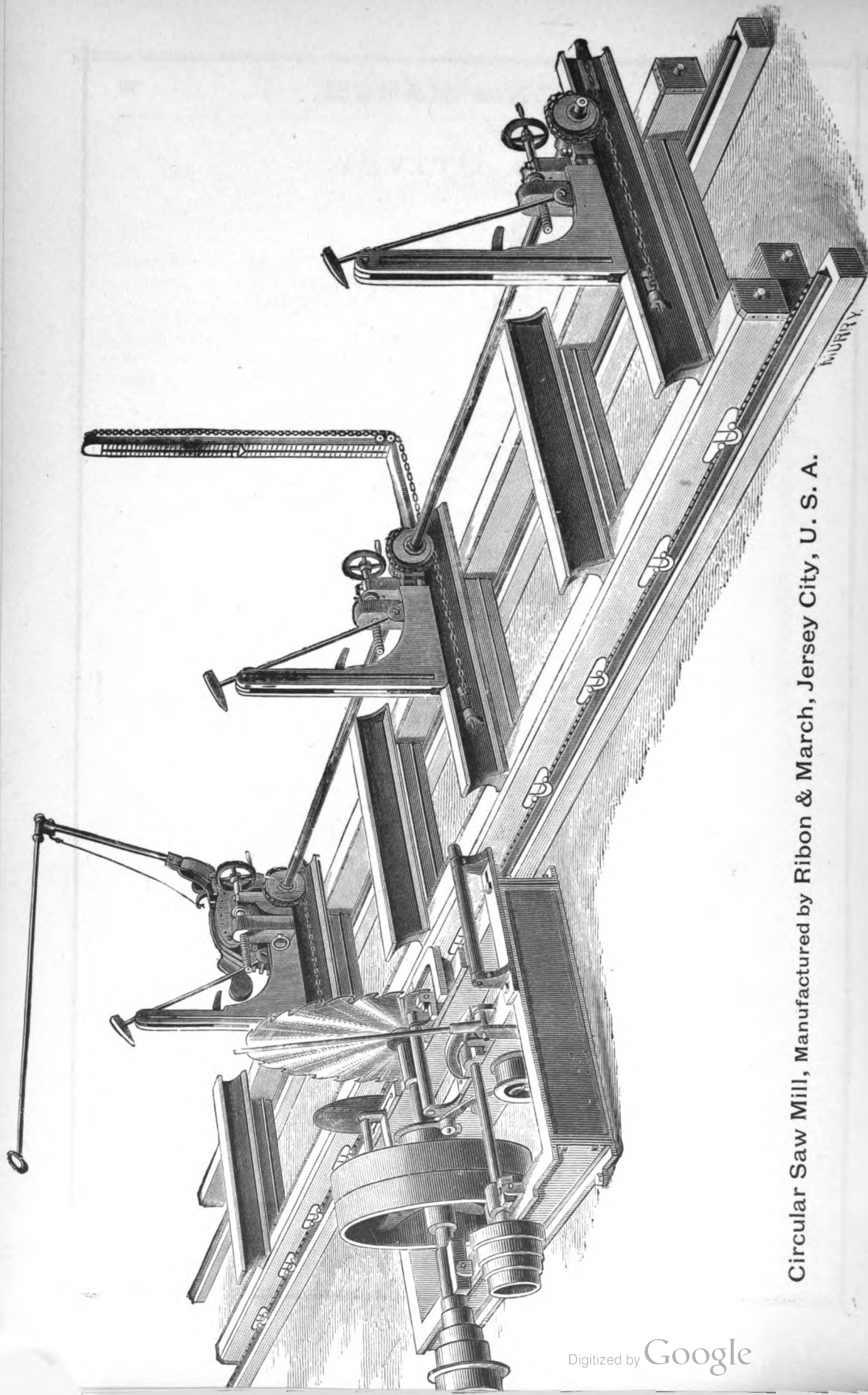
Rams of any weight and frames with various lengths of guides can be ordered from us to suit different kinds of work.

The following table may prove useful in making estimates of fall and weight of ram required to drive piles of various sizes in different kinds of soil.

ENERGY OF FALL OF RAM WEIGHING ONE TON.

| | | | | | | | | | | | | | | | | | | | |
|-------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Fall in Feet..... | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| Time in Seconds | 0.25 | 0.35 | 0.43 | 0.50 | 0.56 | 0.61 | 0.66 | 0.70 | 0.75 | 0.79 | 0.83 | 0.86 | 0.90 | 0.93 | 0.96 | 1.00 | 1.08 | 1.05 | 1.09 |
| Effect in Tons.. | 8.0 | 11.8 | 18.9 | 16.0 | 57.6 | 19.6 | 21.2 | 22.7 | 24.1 | 25.3 | 26.6 | 27.8 | 28.9 | 30.0 | 31.0 | 32.1 | 33.1 | 34.0 | 35.0 |

| | | | | | | | | | | | | | | | | | | | |
|-------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Fall in Feet..... | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 |
| Time in Seconds | 1.11 | 1.14 | 1.17 | 1.20 | 1.22 | 1.25 | 1.27 | 1.29 | 1.32 | 1.34 | 1.37 | 1.39 | 1.41 | 1.43 | 1.45 | 1.48 | 1.50 | 1.52 | 1.54 |
| Effect in Tons.. | 35.9 | 36.7 | 37.6 | 38.5 | 39.3 | 40.1 | 40.9 | 41.7 | 42.4 | 43.2 | 43.9 | 44.6 | 45.4 | 46.1 | 46.8 | 47.4 | 48.1 | 48.8 | 49.4 |



Circular Saw Mill, Manufactured by Ribon & March, Jersey City, U. S. A.

Circular Saw Mill.

THE annexed engraving represents a first-class saw mill with all the improved appliances necessary to saw lumber of all sorts. It has the improved Cable Chain Head Block and improved Lever Set, simple, durable and always accurate.

It has a wide carriage, made in sections of twelve feet each, to be joined to any length, with iron joints and angle irons on carriage-plates. The arbors of this mill are heavy, with long bearings fitted to self-adjusting and self-oiling boxes. It will receive the largest or the smallest saws, and will saw six-thou-

sand feet per hour, if required. In every part, this mill is constructed in a superior manner, and is certain to give satisfaction.

When examined it will be found simple and complete in all its parts, and of ample strength; and for sawing any kinds of logs or any class of lumber it is superior to any and every other mill ever offered to the public.

In regard to strength, it is only excelled by our Timber Mill. It is made with iron or wood frames, as may be desired.

We also manufacture Mulay and Gang Saw Mills of any size and capacity required.

CIRCULAR SAW MILL, WITH WOODEN FRAMES AND WITHOUT SAWS.

- No. 4. 24 feet Carriage, Two Screw Head Blocks, for Saws up to 48 inches in diameter.
 3. 24 " " " " " " " " " " 54 " "
 2. 24 " " " " " " " " " " 72 " "
 1. 24 " " " " " " " " " " 72 " "

Timber Mill, 24 feet Carriage.

Double Mill, 24 " " for Nos. 1 and 2.

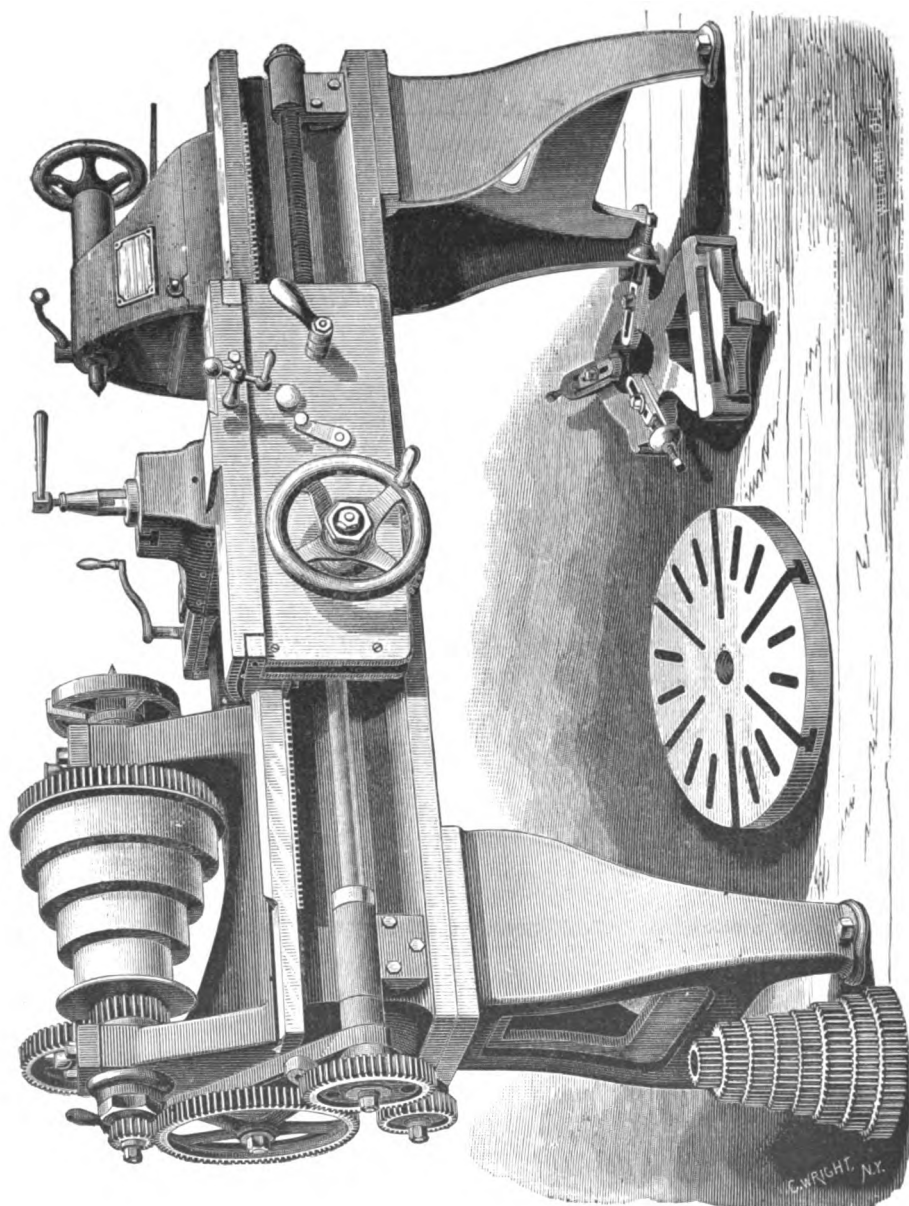
CIRCULAR SAWS.

| | | | | | |
|-----------------------|---------|----------------------|---------|----------------------|----------|
| 26 inch 11 gauge..... | \$12 00 | 42 inch 8 gauge..... | \$40 00 | 58 inch 5 gauge..... | \$150 00 |
| 28 " 10 "..... | 14 00 | 44 " 7 "..... | 48 00 | 60 " 5 "..... | 175 00 |
| 30 " 10 "..... | 16 00 | 46 " 6 "..... | 56 00 | 62 " 4 "..... | 200 00 |
| 32 " 10 "..... | 18 50 | 48 " 6 "..... | 65 00 | 64 " 4 "..... | 230 00 |
| 34 " 9 "..... | 21 00 | 50 " 6 "..... | 75 00 | 66 " 4 "..... | 265 00 |
| 36 " 9 "..... | 24 00 | 52 " 5 "..... | 90 00 | 68 " 4 "..... | 300 00 |
| 38 " 8 "..... | 28 00 | 54 " 5 "..... | 105 00 | 70 " 3 "..... | 340 00 |
| 40 " 8 "..... | 33 00 | 56 " 5 "..... | 125 00 | 72 " 3 "..... | 380 00 |

Rubber Belting.

Made with Cotton Duck, weighing Two Pounds per Yard; manufactured expressly for the purpose.

| | | | |
|--------------------------|------------------|---------------|------------------|
| 2 inches, Three Ply..... | \$0 17 per foot. | Four Ply..... | \$0 21 per foot. |
| 2½ " "..... | 22 " " | " "..... | 26 " " |
| 3 " "..... | 26 " " | " "..... | 31 " " |
| 3½ " "..... | 30 " " | " "..... | 37 " " |
| 4 " "..... | 34 " " | " "..... | 42 " " |
| 4½ " "..... | 39 " " | " "..... | 47 " " |
| 5 " "..... | 43 " " | " "..... | 52 " " |
| 5½ " "..... | 48 " " | " "..... | 57 " " |
| 6 " "..... | 52 " " | " "..... | 62 " " |
| 7 " "..... | 60 " " | " "..... | 73 " " |
| 8 " "..... | 70 " " | " "..... | 84 " " |
| 9 " "..... | 80 " " | " "..... | 95 " " |
| 10 " "..... | 90 " " | " "..... | 1 07 " " |
| 11 " "..... | 1 00 " " | " "..... | 1 18 " " |
| 12 " "..... | 1 08 " " | " "..... | 1 30 " " |
| 13 " "..... | 1 18 " " | " "..... | 1 42 " " |
| 14 " "..... | 1 28 " " | " "..... | 1 54 " " |
| 15 " "..... | 1 38 " " | " "..... | 1 66 " " |
| 16 " "..... | 1 50 " " | " "..... | 1 78 " " |



Engine Lathe, with Adjustable Rest.

General Description of Engine Lathes.

15 and 18 INCHES SWING.

ADJUSTABLE REST.

THESE Lathes are made from new and most improved patterns, are very heavy, and are fitted up in the most thorough and workman-like manner. They have a very powerfully Geared Head, low adjustable Rest, heavy Screw and Screw Gears, and Forged Cast Steel Spindles.

The Head Block is webbed across beneath the cone pulleys in such a manner as to give great additional firmness, and to admit of larger cone pulleys than is usual on these sizes of lathes, with gearing to correspond. Head Block is secured by 4 large Holding down screws passing through a flange outside.

The Live Spindle has unusually large and long journals, running in Bronze Boxes, and is made of hammered cast steel.

The Tool Rest may be adjusted to any height without loosening the tool in the tool-post, by means of an adjusting screw at the back, which passes through a ball nut in the upper part of the rest, and is fitted with a ball and socket at its lower end to allow of motion for the upper part of the rest, which turns on heavy steel points and between heavy cheek pieces cast on the lower portion of the front of the rest, the whole rest thus firmly screwed together is locked or gibbed under the outer flanges of the lathe bed, thus combining the two old fashions of locking and weighting.

The Whole Rest being broad and low, admits of the most swing over it that is consistent with firmness, while the cross screw will traverse the tool the whole distance from the center to the circumference of the circle which

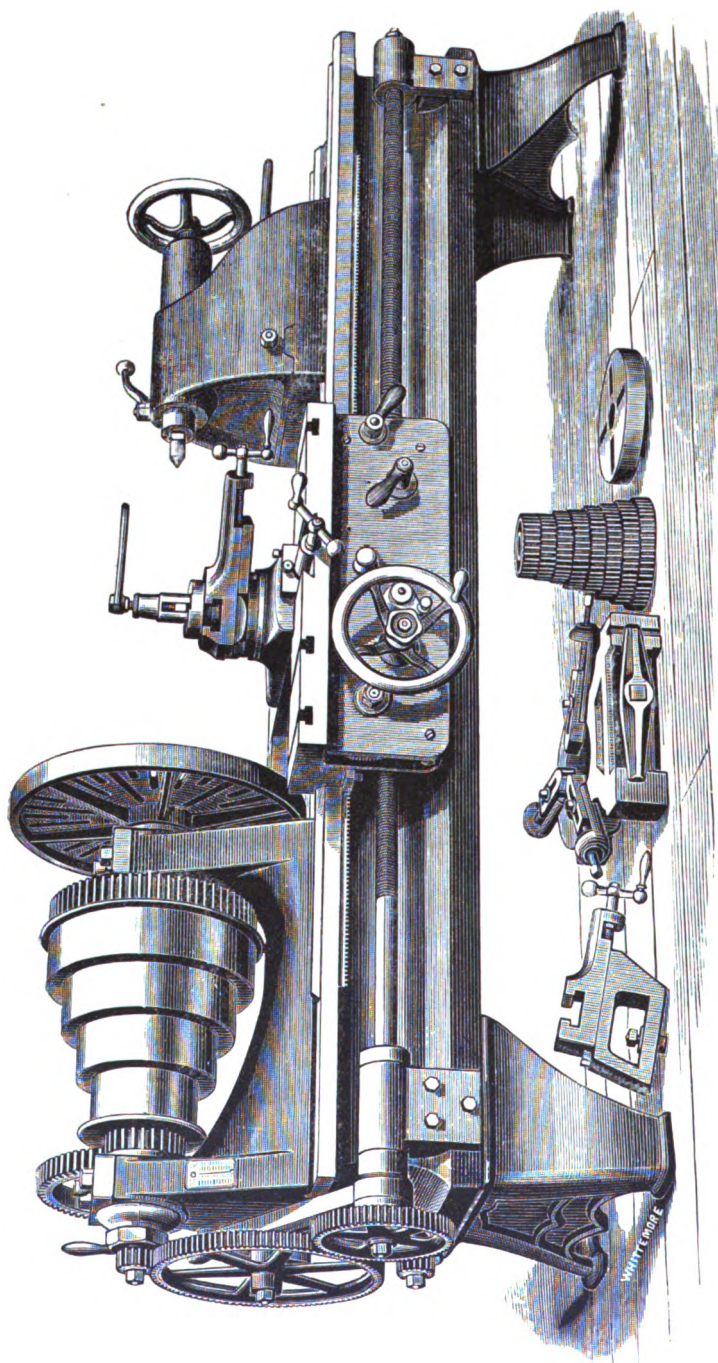
the lathe will swing, without readjusting. The Cross Screw is well protected from chips and dirt. The rest slides upon inverted V tracks, bearing only on the slopes, and will never wear loose.

The Rod or Independent Feed is independent of the Leading Screw (which is used for screw cutting only, and is therefore less exposed to irregular wear), and consists mainly of a light and quick running rod, upon which is mounted a Hardened Polished Steel Worm which runs in an oil well, thus being constantly lubricated, and which through a large gun-metal worm gear and wrought iron pinion, communicates with a Wrought Iron Rack, upon the front flange of the lathe bed, giving an even and powerful motion to the rest. This communication is made and broken as occasion requires to stop or start the rest, by means of a powerful and quick-acting friction screw.

The Tail Block is secured by large holding down bolts, fitted with wrought iron nuts tapped clean through and case hardened.

A Counter Shaft, with iron cone pulleys, swivel hangers, hook and staple for end of shipper-rod, iron sliding-rod, belt guides, etc., is furnished with each lathe. Either tight or loose, or clutch pulleys, as may be desired, are furnished on the counter shaft.

A Large Extra Face Plate and Center Rest, together with suitable wrenches, go with the lathe; all the small parts exposed to bruising wear are case hardened. The whole making the most convenient and efficient lathe now in use for general purposes.



Engine Lathe, with Compound Rest.

General Description of Engine Lathes.

19, 22, 26, 30, 36 and 40 Inches Swing.

NEW DESIGN.

THESE Lathes are simple in design, very heavy and convenient, have back gears, screw-cutting apparatus, compound rests, power cross feeds, extra tool blocks for pulleys or other work as large as lathes will swing, large and small face plates, center rests, complete counter shafts, wrenches, &c.

All moving parts have unusually long bearings, viz: the rests or carriages on the bed, also the tail blocks, the cross shoes on rest, the tool shoes on swivels, the top of the tail blocks on bases in setting to turn tapers, the length of tail spindles, also head spindles and their journals. The diameters of the cones, gears, journal bearings, and tail spindles are unusually large.

Feed Motions are positive and very simple, tool can be made to travel forward and backward the length of the bed, or across the rest by a single movement of handles on the rest, hence, always within the reach of the workman when watching the cut. The cross feeds have sufficient traverse to "square off" entire swing of lathes with setting the tool but once.

Tail Blocks fastened to bed by movement of one bolt only, and travels nearly the entire width of the bed in setting over for taper, without the usual necessity of taking out one bolt, and are operated by a single screw from the front side.

The Feed Gearing is connected to rack on the beds and driven from a slot in the screws, arranged not to impair the accuracy of the threads for screw cutting, and is without worm or screw.

The Rack Pinions are so arranged that they can be drawn entirely out of the rack, absolutely preventing the friction feeds from becoming engaged, while cutting screws, and thereby causing breakage; also avoids wear of gearing and shafts in aprons when screw cutting.

The Rests are gibbed to the outside of the beds, both front and back, by a new device that permits adjustment, without use of springs or additional pieces.

The Feed Motions are applied by a simple and positive friction. No studs are used, every wheel or gear is mounted on a shaft having bearing at each end. All small gears and shafts are made of wrought iron or steel, and all parts subjected to bruising wear are case hardened.

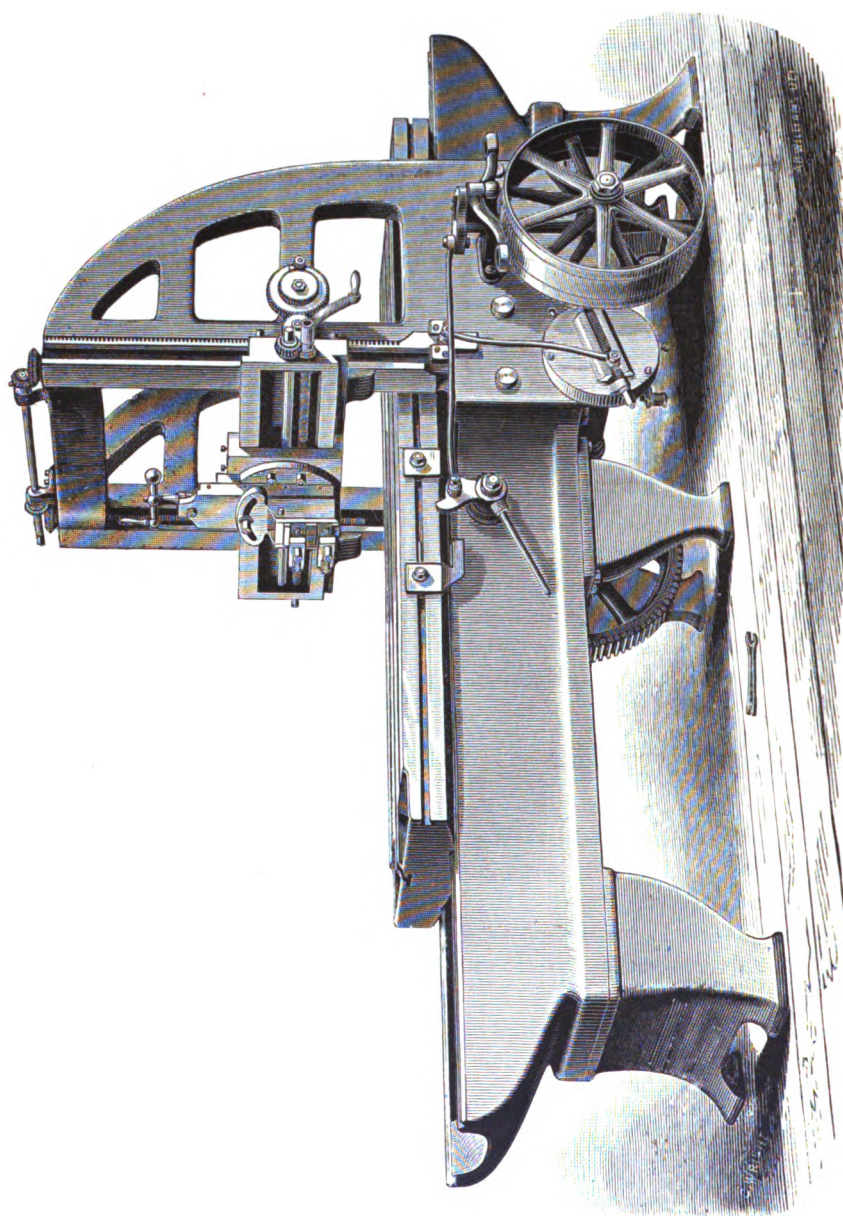
A Shafting Attachment can be used on these Lathes when they are especially intended for turning shafting.

It consists of a Heavy Arch Piece bolted on to the Rest, carrying three turning tools, two on the front and one on the back of shaft, and having a hole bored out in the upper part of Arch to receive bushes for steadying the shaft while turning, or to hold fluted rings for finishing the shaft.

The first tool on the front takes off the first chip, and the tool on the back turns the shaft to its proper size.

After it passes through the bush the water-polishing tool finishes the shaft, leaving it perfectly round and smooth.

Each tool is adjusted by a separate screw operating the tool block that carries it.



New Improved Iron Planer.

Description of Iron Planer.

NEW DESIGN.

MADE from entirely new and very heavy patterns (including new features patented), giving parts subjected to greatest strains an unusual size.

Beds have great depth and sufficient length to prevent table from tipping when heavily loaded on overhanging ends.

Tables are thick, with bolt slots truly planed and pin holes carefully reamed for convenience in fastening work.

Uprights or Posts are very heavy and stiff, having great breadth of base, making it possible to take heavy cuts when bar is at greatest height from table, without jar or chatter; uprights are designed to allow greatest possible amount of light on work.

A Powerful Train of Cut Gears, Cut Rack on the Table, Shafts of Large Diameter with bearings double the usual length, all making a machine that will plane surfaces truly and without chatter.

The Patented Feeding Device gives automatic feed in all directions, is adjustable from fine to very wide cuts for finishing, and takes no power except when feeding.

The Crank for operating the cross feed by hand can be applied to end of rod in bar, thus operating the vertical and angular feeds by hand when the handle on perpendicular feed screw is not within easy reach.

To return the table after the cut, in quickest practical time, can best be effected by open and cross belts, and pulleys of different diameters on counter shaft, thus dispensing with extra gears; speed can be increased or dimin-

ished by purchasers to meet their requirements by changing the countershaft pulleys.

Patented Automatic Belt Shifter transfers but one belt at same time, thereby preventing two belts running in opposite directions from being on tight pulley at same time, thus obviating "squeeling" of belts and jar of machine; it is entirely disconnected from feeding apparatus, hence works easily, giving operator quick and perfect control over movements of the table without using the countershaft shipper; is arranged to throw out to clear the reversing dogs on the table which can then be run backward to examine the work, the dogs not being loosened retain necessary stroke and also allow a temporary adjustment of stroke to places not in the limit fixed by the position of the dogs.

Wrenches, complete countershaft, &c., &c., are furnished Machines, with small parts suitably boxed. Extra heads can be supplied for any size at additional cost. Machines can be furnished to plane any desired length.

Our 26-inch Planers (26 inches wide by 26 inches high) are made in the following lengths: 5 feet (4900 lbs.), 6 feet (5400 lbs.), 8 feet (6400 lbs.), and 10 feet (7400 lbs.).

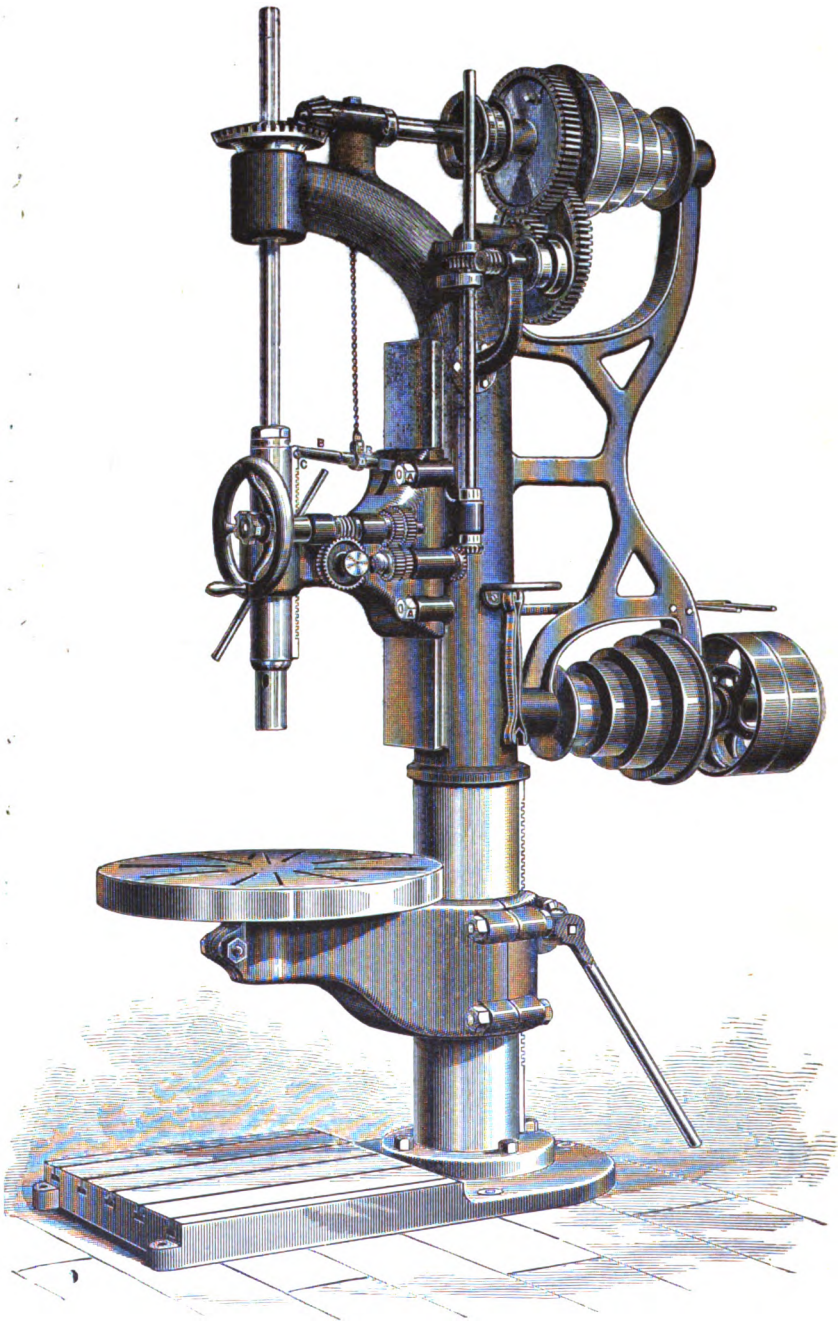
Our 32-inch Planers are made 6, 8, 10, 12, 14 and 16 feet long.

Our 38-inch Planers are 8, 10, 12, 14, 16, 18 and 20 feet long.

Our 42-inch Planers are 10, 12, 14, 16, 18, 20, 24 and 30 feet long.

Our 52-inch and 60-inch Planers are made 10, 12, 16, 20, 24 and 30 feet long.

Upright Machine Drill.



Description of Upright Drill.

P A T E N T E D .

NEW DESIGN.

THESE drills are made from entirely new designs, with the metal placed to give the greatest resistance to breaking strains. They are well proportioned, with great strength and accuracy of working parts, all of which have large wearing surfaces; they also have all of the latest attachments for convenience in use.

The Drills have a Patented Device, whereby the entire Adjustable Head, including the Spindle, is balanced by one and the same Weight that balances the spindle alone, thereby dispensing with rack, pinion, ratchet, pawl and wrench, otherwise necessary to move the adjustable Drilling Head up or down the face of column. This head is held securely in position by tightening the two nuts "A" "A," (see cut). The weight then acts on the spindle in the usual manner through the lever "B" "B," which is attached to spindle at "C." When nuts "A" "A" are loose, the head can be easily moved up or down by hand.

This device also admits of keeping the spindle evenly balanced, whether the smallest Drill or heaviest Boring Bar, or other tool is used, hence the Quick Return motion by hand works as easily with a very heavy tool as with a light one.

The Drill Spindles are made from hammered cast steel, large in diameter, and have Hand, and three changes of Power Feed, the latter being connected to them by a simple and posi-

tive friction, within easy reach and operating quickly. The Spindles are also provided with a quick return motion, that is very convenient as a hand feed for drilling small holes, and for quick adjustment of cutting tools; it can also be used for slotting and splining.

This motion is disconnected from the other feeds by means of a self-operating clutch, which obviates the necessity of dropping the worm out of worm gear, and hence the necessity of getting the thread of worm and teeth of worm-gear opposite, when necessary to connect them.

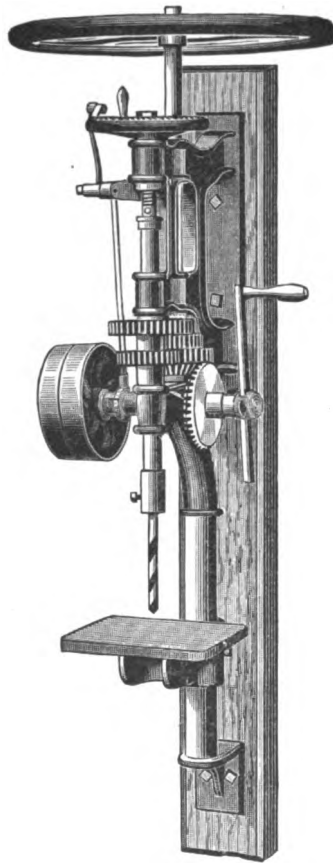
The Circular Tables can be revolved around their own axis and swing around the column, thus allowing the placing of any point on the surface of table under center of spindle; they can also be raised and lowered to any position in their traverse on the column.

The Base Tables are accurately planed, having T slots for convenience in bolting work, and are so made that bushings may be fitted, sustaining end of Boring Bars; they also reach back under columns their full width, giving very large supporting surfaces on the floor. Work too large to be drilled on the circular tables can be drilled as accurately on these base tables.

The cones and gears are unusually large and powerful. Suitable Wrenches are furnished. No over-head counter shaft required.

The Portable Upright Drill.

FOR HAND OR POWER.



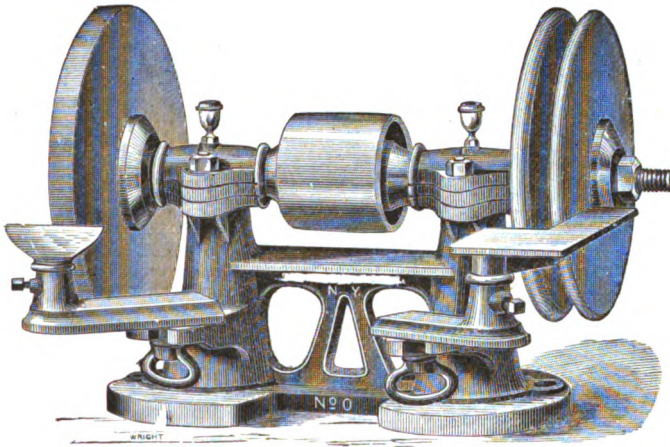
THIS Drill is arranged with slip gear, whereby a quick or slow motion may be given to the drill for light or heavy work. It can be arranged to be worked by hand, for which crank is furnished, or by power with belt on

fast and loose pulley, shown in cut. It will drill from $\frac{1}{4}$ to $1\frac{1}{2}$ inch holes. We make smaller sizes exclusively for hand power to drill $\frac{1}{8}$ to 1 inch holes, and weighing from 80 to 160 lbs.

The weight of the above Drill is 250 lbs., and price \$75.00.

PULLEY, \$4.00 EXTRA.

Emery Wheels and Grinders.



Cosmopolitan Grinder, Number Ought.

THERE is no tool more useful and necessary, in a manufacturing establishment, than an Emery Wheel. It is, in fact, a rotary file, always sharp and ready to cut, with unusual rapidity, any kind of metal.

Next to the diamond and ruby, emery is the hardest known substance, and a wheel of this material will grind off the teeth of the hardest tempered file or the edges of chilled cast steel, without perceptible damage to the wheel.

The foundryman can rapidly grind off the rough edges and other imperfections of steel and iron castings.

The wood worker can sharpen and gum saws, grind planer knives, and shape moulding cutters.

The machinist uses the Emery Wheel for trueing up hardened tools, and for cutting steel or iron.

For the brass worker emery offers a variety of applications, to trim and square up castings and to rapidly polish and finish work by means of the leather covered wheel or polishing belt.

To manufacturers who are desirous of getting work done cheaply and expeditiously, the liberal use of Emery Wheels will save valuable time and many files.

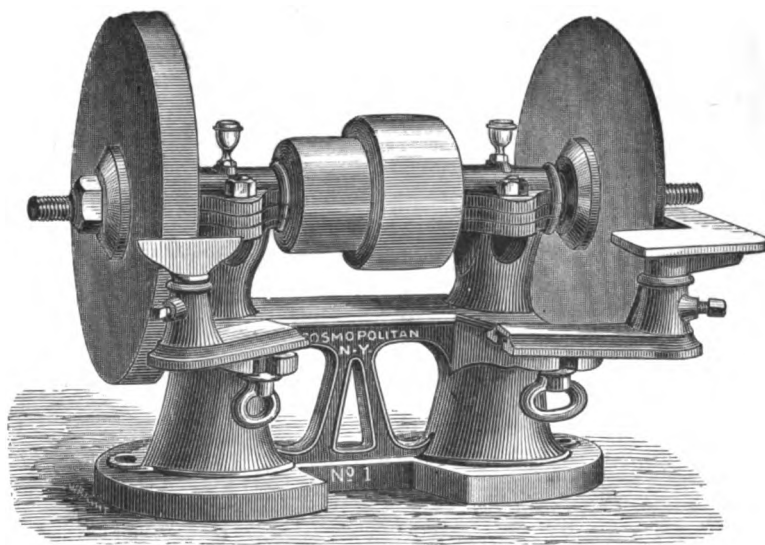
There is no tool that will perform such a variety of useful operations in reducing and cutting metal as the Emery Wheel. Establishments working without it turn out many jobs at double the cost.

According to annexed schedule of sizes and prices it will be seen that there are seven sizes, the smallest of which is expressly made for jewelers, pattern makers, inventors and others, who need an Emery Wheel to cut and finish small work in iron, steel or brass. Our next size is useful for lockmakers, mill-stone pickers, last makers, wood or brass turners, type foundries, etc.

These two sizes carry but one wheel each, and where but a limited amount of work is to be done, are very efficient.

The next three sizes (Nos. 0, 1 and 2), we give illustrations of, carry two or more wheels each, and will admit of two men using the

Emery Wheels and Grinders.



Cosmopolitan Grinder, Number One.

grinder at the same time. They can be belted up or down, have patent oil cups and complete sets of adjustable rests.

| No. | Size of Emery Wheels. | Thickness of Wheels. | Price of Grinder. | Grinder with Counter-shaft. | Grinder with Pedestal. | Diameter of Steel Arbor. |
|-----|-----------------------|----------------------|-------------------|-----------------------------|------------------------|--------------------------|
| 000 | 1: 6 | 1 | \$5.00 | ..... | ..... | .. |
| 00 | 6: 10 | 2 | 12.00 | \$22.00 | \$58.00 | 11 |
| 0 | 6: 12 | 2 | 19.50 | 30.00 | 54.00 | 11 1/2 |
| 1 | 10: 14 | 2 1/2 | 28.50 | 42.00 | 66.50 | 15 1/2 |
| 2 | 14: 20 | 3 | 43.00 | 60.00 | 80.00 | 17 1/2 |
| 3 | 16: 24 | 4 | 96.50 | 115.00 | ..... | 19 1/2 |
| 4 | 24: 48 | 5 | 150.00 | 175.00 | ..... | 24 |

Emery Wheels, extra.

No. 0 is a favorite size with most manufacturers, as it occupies but little space and will do the work of many men with files. For grinding saws, moulding cutters and tools of all kinds it is indispensable.

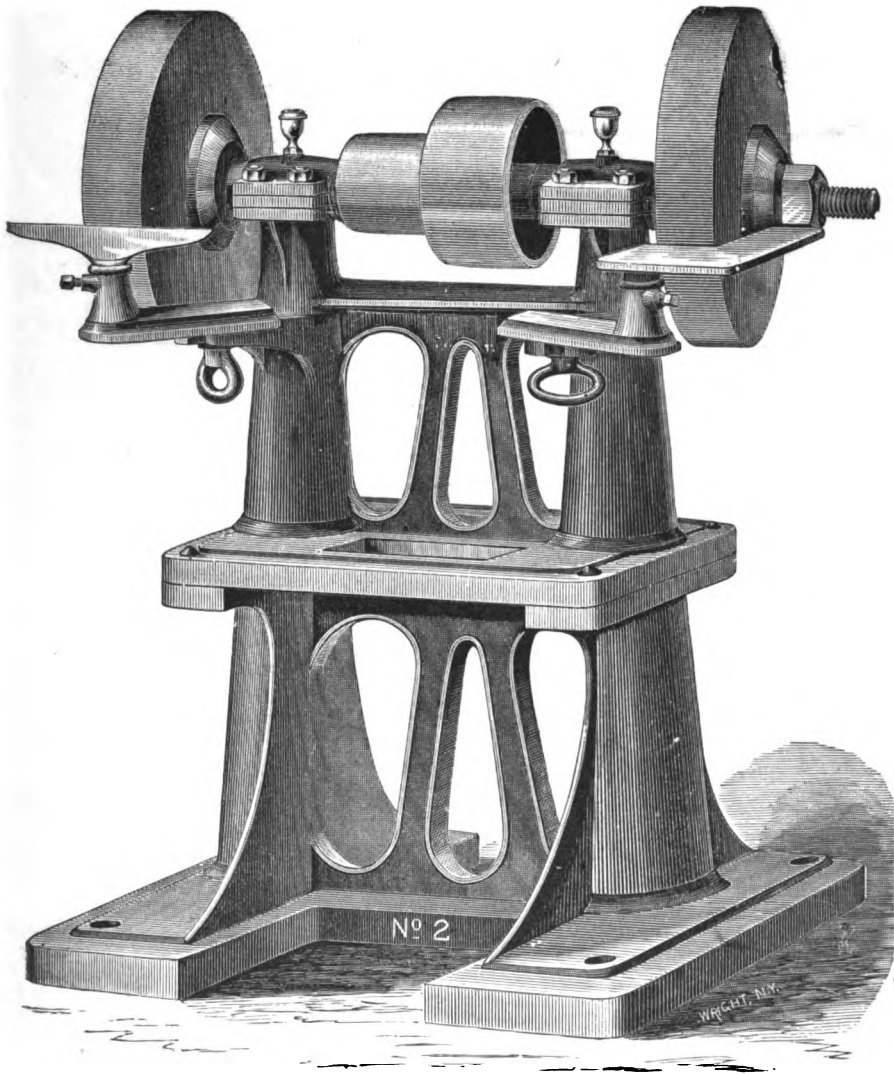
No. 1 has, in addition to previously described advantages, a cone pulley for two

speeds. This machine is well built and made expressly for small shops. We recommend our customers to order one coarse and one fine wheel, representing different grades of files; it is also valuable for grinding twist drills, hardened tools, dies, etc.

No. 2 may be set on a bench or on its iron pedestal as shown in cut. When thus mounted it can conveniently be placed out on the floor so that several persons can work on it at the same time, either on the front or sides of the wheels. There are many jobs in the machine shop that can be readily done with the Emery Wheel, which are now done at great loss of time and labor at the vise or with the lathe and planer. This grinder will rough out keys, gibbs, slides, bolt heads, nuts, hardened tools, etc.; besides grinding castings and doing the general jobbing work of a machine shop.

No. 3 is a strong and heavy machine for

Emery Wheels and Grinders.

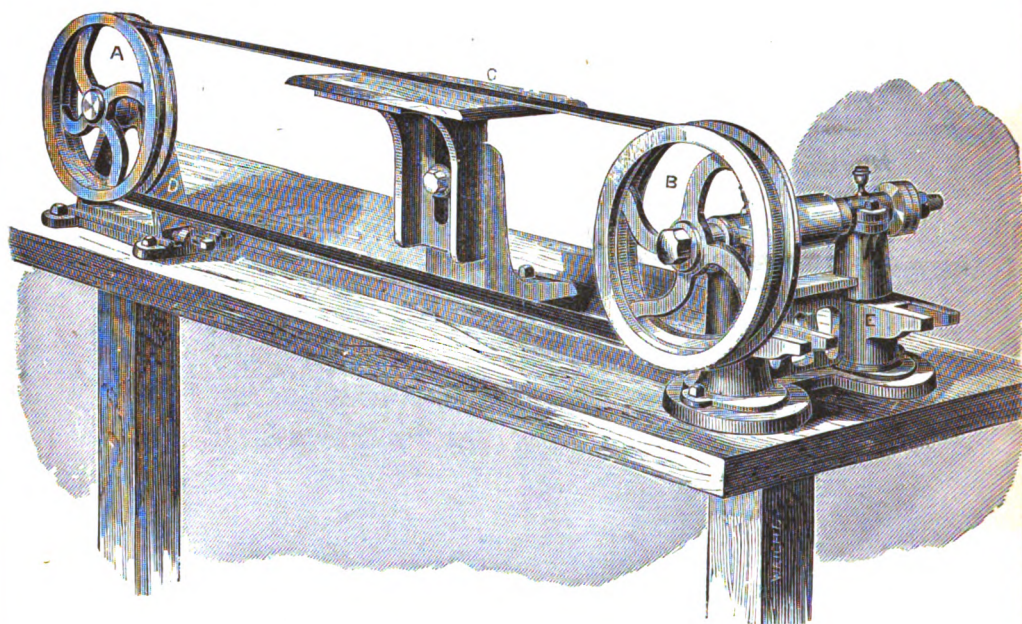


Cosmopolitan Grinder, Number Two.

foundry work, and has the frame and stand cast in one solid piece, insuring perfect rigidity. The journal boxes are $6\frac{1}{2}$ inches long with cut channels for oil distribution over

whole bearing surface. Nothing operates so quickly and cheaply in grinding rough edges, lumps, fins, and gates from castings. It does filing and chipping by steam.

Emery Wheels and Machinery.



Emery Belting Machine.

THESE Belts are made in one continuous piece without hooking or lacing. Two thicknesses of strong canvass, with vulcanized rubber between to cement them together, are spliced in such a way as to present a smooth surface all the way round.

They are made 6, 7, 8, 9, 10, 12 and 14 feet in circumference, and any width from half an inch to twenty-four inches.

The belt should be slightly warmed when the glue is applied, and the emery also heated, otherwise the glue will chill and prevent its adhesion. For some work two grades of emery, one coarse and the other fine, may be glued lengthwise, side by side, on the same belt; the coarse emery for roughing out the work, and the fine for finishing it before leaving the workman's hands. For this purpose wide belts should, of course, be used.

The above engraving shows how Traut's Endless Polishing Belt is used when a perfectly flat surface is desired, the belt being kept from sagging by the small table rest between the pulleys; this may be removed when it is desired to polish round surfaces, such as brass faucets, shovel handles, wagon spokes, etc. The belting attachment consists of a flanged pulley and adjustable standard.

| | |
|------------------------|---------|
| For 2 inch belts. | \$15.00 |
| For 3 inch belts. | 18.00 |
| For 4 inch belts. | 20.00 |
| For 5 inch belts. | 25.00 |

Pulleys for a No. 0 or No. 1 grinder.

A double belting machine of four pulleys suitable for hardware manufacturers, etc., is built in a substantial manner on a strong hard-wood frame.

Price \$125.00

Single belting machine on hard-wood frame, 85.00

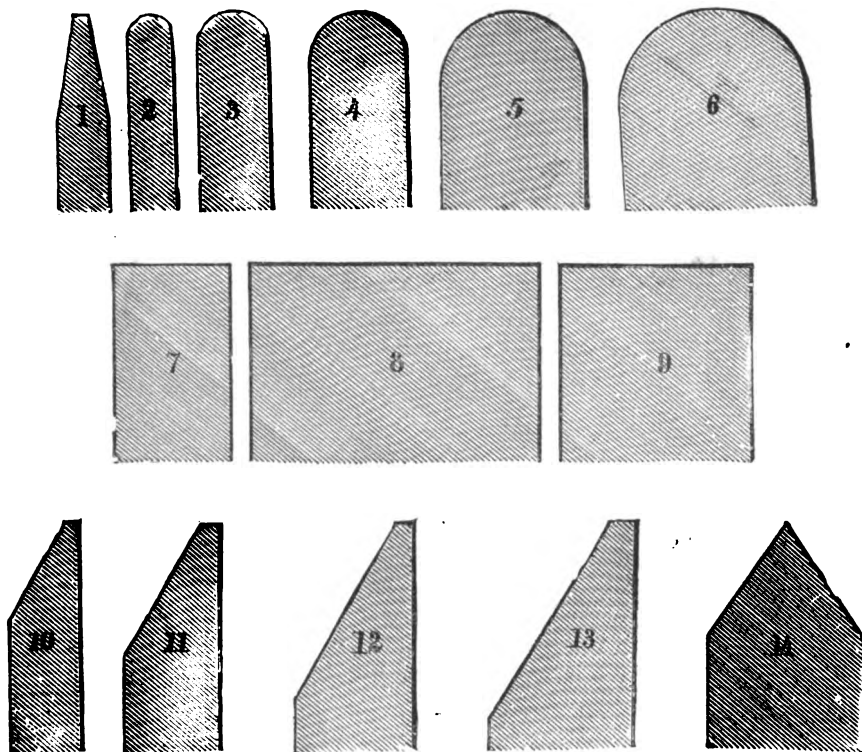
The belts are always extra; price per foot for every inch in width.15

Emery Belting Machines are admirably adapted for finishing, leveling and laying the grain on steel rules, squares, levels and machinists' tools, on hinges and butts, for lock and padlock work, for strapping brass cocks and plumbers' work, for brackets, cutlery, surgical instruments, engravers' plates, gas fixtures, carpenters' planes, grates, fender work, etc.

They are also invaluable in machine and locomotive shops for finishing slides, gibbs and keys after case hardening, and in foundries for finishing off hardware or other small castings.

The Sand Belt is adapted for sanding table frames, furniture, chair and cabinet work; for wagon bodies and wheel work, light carriage work, etc.; for smoothing ivory, bone, shell, rubber and ebony; for finishing barrels, casks, kegs, tubs, buckets, oars, spars, ladders, poles, boxes, handles, etc.

Emery Wheels.



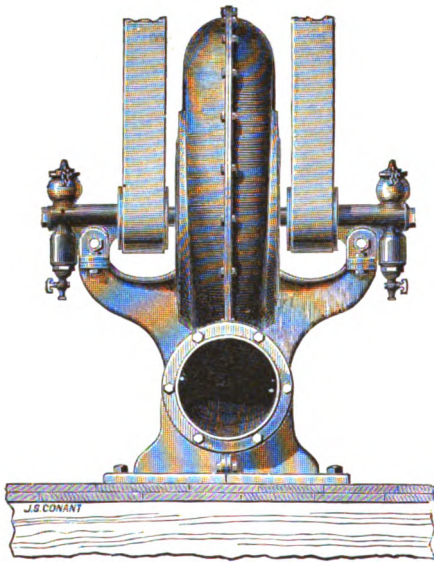
WHEELS of the above or any other shape can be ordered of us of any size wanted, according to schedule of prices given below; special sizes up to six feet in diameter made to order.

SIZES AND PRICES OF EMERY WHEELS.

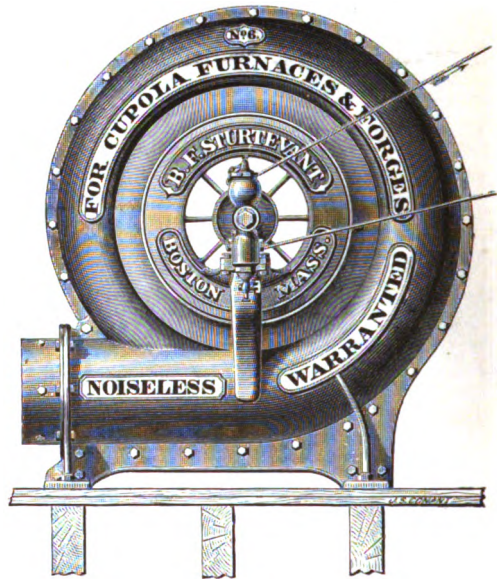
| | THICKNESS OF WHEELS IN INCHES. | | | | | | | | | | | | | | | | |
|-------|--------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|------|
| | 1/4 | 3/8 | 1/2 | 5/8 | 3/4 | 1 | 1 1/4 | 1 1/2 | 1 3/4 | 2 | 2 1/4 | 2 1/2 | 2 3/4 | 3 | 3 1/2 | 4 | |
| 1 1/2 | \$.80 | \$.85 | \$.40 | \$.42 | \$.45 | \$.50 | \$.55 | \$.60 | \$.65 | \$.70 | \$.78 | \$.85 | \$.94 | \$ 1.00 | \$ 1.12 | \$ 1.25 | 6200 |
| 2 | .37 | .42 | .50 | .53 | .55 | .60 | .65 | .70 | .80 | .90 | .96 | 1.00 | 1.15 | 1.25 | 1.45 | 1.60 | 5600 |
| 2 1/2 | .50 | .60 | .70 | .74 | .78 | .87 | .92 | 1.00 | 1.15 | 1.25 | 1.40 | 1.50 | 1.70 | 1.85 | 2.10 | 2.25 | 4675 |
| 3 | .60 | .73 | .85 | .92 | 1.00 | 1.15 | 1.27 | 1.40 | 1.55 | 1.65 | 1.85 | 2.00 | 2.25 | 2.40 | 2.80 | 3.25 | 3750 |
| 3 1/2 | .75 | .87 | 1.00 | 1.12 | 1.25 | 1.40 | 1.60 | 1.80 | 2.15 | 2.25 | 2.60 | 2.75 | 3.00 | 3.25 | 3.75 | 4.25 | 3175 |
| 4 | .80 | .95 | 1.10 | 1.22 | 1.35 | 1.65 | 1.95 | 2.20 | 2.50 | 2.80 | 3.15 | 3.40 | 3.75 | 4.00 | 4.70 | 5.30 | 2000 |
| 5 | 1.00 | 1.20 | 1.40 | 1.57 | 1.75 | 2.10 | 2.50 | 3.00 | 3.50 | 3.85 | 4.35 | 4.80 | 5.30 | 5.70 | 6.70 | 7.70 | 2250 |
| 6 | 1.30 | 1.52 | 1.75 | 2.12 | 2.50 | 3.10 | 3.75 | 4.50 | 5.10 | 5.60 | 6.40 | 7.00 | 7.75 | 8.40 | 9.80 | 11.20 | 1800 |
| 7 | 1.70 | 1.80 | 1.90 | 2.25 | 2.60 | 3.30 | 4.00 | 4.70 | 5.30 | 5.90 | 6.67 | 7.45 | 8.17 | 8.90 | 10.70 | 11.80 | 1600 |
| 8 | 2.00 | 2.25 | 2.50 | 3.00 | 3.50 | 4.50 | 5.50 | 6.50 | 7.50 | 8.50 | 9.50 | 10.50 | 11.50 | 12.50 | 14.50 | 16.50 | 1450 |
| 9 | 2.37 | 2.60 | 2.85 | 3.40 | 3.97 | 5.12 | 6.13 | 7.15 | 8.23 | 9.33 | 10.47 | 11.62 | 12.71 | 13.80 | 16.00 | 18.35 | 1800 |
| 10 | 2.75 | 2.95 | 3.15 | 3.80 | 4.45 | 5.75 | 6.77 | 7.80 | 8.97 | 10.15 | 11.45 | 12.75 | 13.92 | 15.10 | 17.50 | 20.20 | 1150 |
| 12 | 3.00 | 3.55 | 4.00 | 5.00 | 5.75 | 7.50 | 9.25 | 11.00 | 12.50 | 14.00 | 15.75 | 17.50 | 19.25 | 21.00 | 24.50 | 28.00 | 900 |
| 14 | 4.70 | 5.50 | 6.25 | 7.50 | 9.00 | 11.25 | 13.37 | 15.50 | 17.50 | 19.50 | 22.00 | 24.50 | 27.00 | 29.50 | 34.00 | 39.00 | 750 |
| 16 | 6.00 | 7.00 | 8.00 | 9.50 | 11.00 | 14.00 | 16.75 | 19.50 | 22.25 | 25.00 | 28.25 | 31.50 | 34.50 | 37.50 | 44.00 | 50.00 | 650 |
| 18 | 7.00 | 8.25 | 9.50 | 11.75 | 14.00 | 18.00 | 21.50 | 25.00 | 28.50 | 33.00 | 36.00 | 40.00 | 44.00 | 48.00 | 56.00 | 64.00 | 600 |
| 20 | 8.00 | 9.50 | 11.00 | 13.50 | 16.00 | 21.00 | 25.00 | 29.00 | 34.00 | 39.00 | 44.00 | 49.00 | 53.50 | 58.00 | 68.00 | 78.00 | 550 |
| 22 | 10.00 | 11.50 | 13.00 | 15.25 | 18.50 | 24.00 | 30.50 | 35.50 | 41.50 | 47.00 | 54.00 | 59.00 | 65.00 | 70.00 | 82.00 | 94.00 | 500 |
| 24 | 11.00 | 13.00 | 15.00 | 18.50 | 22.00 | 29.00 | 35.50 | 42.00 | 49.00 | 56.00 | 63.00 | 70.00 | 77.00 | 84.00 | 98.00 | 112.00 | 450 |
| 26 | 13.00 | 15.00 | 17.00 | 20.00 | 23.00 | 33.00 | 42.00 | 49.00 | 58.00 | 65.00 | 74.00 | 82.00 | 91.00 | 98.00 | 114.00 | 130.00 | 425 |
| 30 | 17.00 | 20.00 | 23.00 | 28.50 | 34.00 | 45.00 | 56.00 | 66.00 | 77.50 | 87.50 | 99.00 | 109.00 | 120.00 | 131.00 | 153.00 | 175.00 | 300 |
| 36 | 25.00 | 29.00 | 33.00 | 41.00 | 50.00 | 64.00 | 80.00 | 94.00 | 110.00 | 125.00 | 143.00 | 156.00 | 171.00 | 188.00 | 219.00 | 250.00 | 275 |

Steel Pressure Blower.

WITH TWO PULLEYS.



Side Elevation.



Front Elevation.

On this page we illustrate the Steel Pressure Blower, justly entitled "noiseless." It is made expressly for iron foundries, and will produce a stronger blast, for the same amount of power, than any other blower.

These blowers are built much heavier and stronger than the pressure blowers heretofore made, particularly in the running parts where they are subject to the most wear.

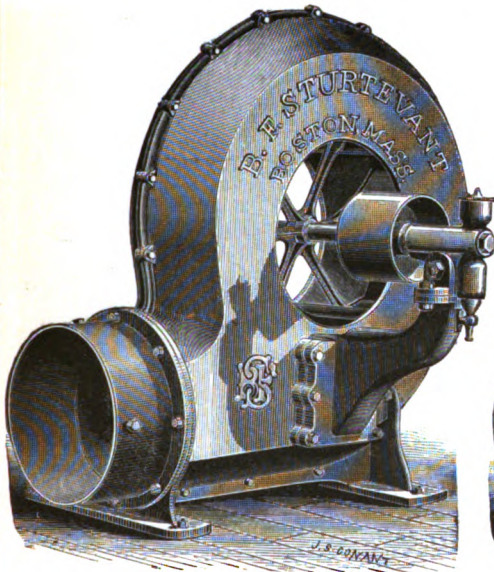
The new journals used are especially designed for use on fan blowers, and are undoubtedly of the best known construction for the purpose. They possess great advantages over the ball and socket journals heretofore made, while the other parts are equally improved over anything hitherto known in the trade. The necessity for sending duplicate sets of self-oiling journal bearings is done away with, by the substitution of these greatly

improved boxes. It is always desirable for us to know what the Steel Pressure Blower, ordered, may be required for, and the sizes, number and other particulars of cupolas, etc., which it is to operate; also the quantity and quality of fuel consumed, and the kind, as well as the amount, of material manufactured.

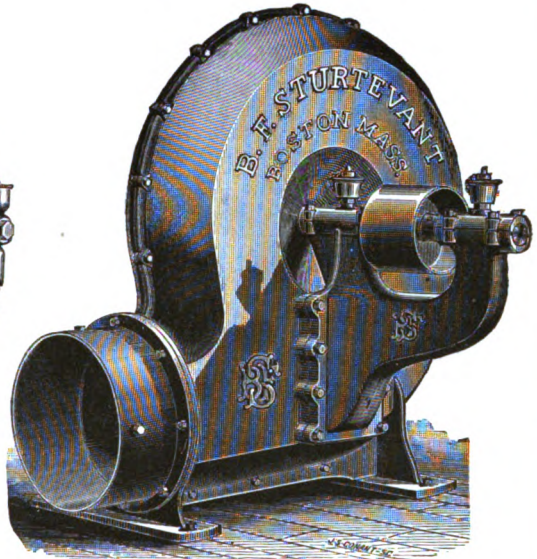
| Number of Blower. | Number of Belts. | Size of Blower in inches. | Diameter of Pulley in inches. | Face of Pulley in inches. | Diameter of Outlet. | Price, without Counter-Shafts or Pulleys. |
|-------------------|------------------|---------------------------|-------------------------------|---------------------------|---------------------|---|
| 00 | 1 | | 21 | 17 | 24 | \$30 |
| 0 | 1 | | 23 | 19 | 26 | 36 |
| 1 | 1 | | 25 | 21 | 28 | 42 |
| 2 | 1 | | 27 | 23 | 30 | 48 |
| 3 | 1 | | 29 | 25 | 32 | 54 |
| 4 | 1 | | 31 | 27 | 34 | 60 |
| 5 | 2 | 40 | 33 | 29 | 36 | 70 |
| 6 | 2 | 45 | 35 | 31 | 38 | 80 |
| 7 | 2 | 50 | 37 | 33 | 40 | 90 |
| 8 | 2 | 55 | 39 | 35 | 42 | 104 |
| 9 | 2 | 60 | 41 | 37 | 44 | 115 |
| 10 | 2 | 65 | 43 | 39 | 46 | 130 |
| | | 70 | 45 | 41 | 48 | 145 |
| | | 75 | 47 | 43 | 50 | 160 |
| | | 80 | 49 | 45 | 52 | 175 |
| | | 85 | 51 | 47 | 54 | 190 |
| | | 90 | 53 | 49 | 56 | 205 |
| | | 95 | 55 | 51 | 58 | 220 |
| | | 100 | 57 | 53 | 60 | 235 |
| | | 105 | 59 | 55 | 62 | 250 |
| | | 110 | 61 | 57 | 64 | 265 |
| | | 115 | 63 | 59 | 66 | 280 |
| | | 120 | 65 | 61 | 68 | 295 |
| | | 125 | 67 | 63 | 70 | 310 |
| | | 130 | 69 | 65 | 72 | 325 |
| | | 135 | 71 | 67 | 74 | 340 |
| | | 140 | 73 | 69 | 76 | 355 |
| | | 145 | 75 | 71 | 78 | 370 |
| | | 150 | 77 | 73 | 80 | 385 |
| | | 155 | 79 | 75 | 82 | 400 |
| | | 160 | 81 | 77 | 84 | 415 |
| | | 165 | 83 | 79 | 86 | 430 |
| | | 170 | 85 | 81 | 88 | 445 |
| | | 175 | 87 | 83 | 90 | 460 |
| | | 180 | 89 | 85 | 92 | 475 |
| | | 185 | 91 | 87 | 94 | 490 |
| | | 190 | 93 | 89 | 96 | 505 |
| | | 195 | 95 | 91 | 98 | 520 |
| | | 200 | 97 | 93 | 100 | 535 |
| | | 205 | 99 | 95 | 102 | 550 |
| | | 210 | 101 | 97 | 104 | 565 |
| | | 215 | 103 | 99 | 106 | 580 |
| | | 220 | 105 | 101 | 108 | 595 |
| | | 225 | 107 | 103 | 110 | 610 |
| | | 230 | 109 | 105 | 112 | 625 |
| | | 235 | 111 | 107 | 114 | 640 |
| | | 240 | 113 | 109 | 116 | 655 |
| | | 245 | 115 | 111 | 118 | 670 |
| | | 250 | 117 | 113 | 120 | 685 |
| | | 255 | 119 | 115 | 122 | 700 |
| | | 260 | 121 | 117 | 124 | 715 |
| | | 265 | 123 | 119 | 126 | 730 |
| | | 270 | 125 | 121 | 128 | 745 |
| | | 275 | 127 | 123 | 130 | 760 |
| | | 280 | 129 | 125 | 132 | 775 |
| | | 285 | 131 | 127 | 134 | 790 |
| | | 290 | 133 | 129 | 136 | 805 |
| | | 295 | 135 | 131 | 138 | 820 |
| | | 300 | 137 | 133 | 140 | 835 |
| | | 305 | 139 | 135 | 142 | 850 |
| | | 310 | 141 | 137 | 144 | 865 |
| | | 315 | 143 | 139 | 146 | 880 |
| | | 320 | 145 | 141 | 148 | 895 |
| | | 325 | 147 | 143 | 150 | 910 |
| | | 330 | 149 | 145 | 152 | 925 |
| | | 335 | 151 | 147 | 154 | 940 |
| | | 340 | 153 | 149 | 156 | 955 |
| | | 345 | 155 | 151 | 158 | 970 |
| | | 350 | 157 | 153 | 160 | 985 |
| | | 355 | 159 | 155 | 162 | 1000 |

The Sturtevant Blower and Exhauster.

REVERSIBLE PATTERN.



Fan Blower.



Exhausting Fan.

THE above cuts represent the reversible patterns of both Fan Blower and Exhauster. The reversible feature is particularly convenient in setting the Fans, as it is sometimes desirable in making improvements or alterations, to change location and to alter connections of Blower or Exhauster.

These fans are made narrow or wide, the former having the advantage of being less noisy, and can be driven at a greater speed; while the wide ones have the advantage of a larger volume of wind at moderate speed.

Any mechanic of ordinary skill will readily

understand how to adjust and keep them in order, and whatever repairs are likely to be required can easily be made, as the various parts are readily accessible.

In ordering Fan Blowers be sure to state the amount and kind of work to be performed; grate surface of furnace to be supplied with air or size of rooms to be ventilated; also length of connecting flue or pipe.

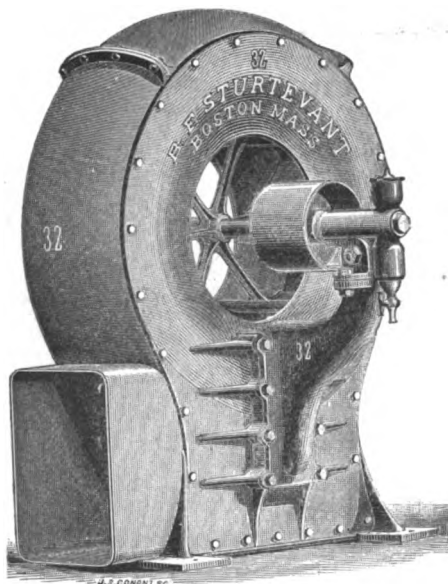
When Exhausting Fans are required, state what kind of material or vapor is to be disposed of, and the distance it is to be carried from exhauster.

SCHEDULE OF DIMENSIONS AND PRICES FOR WIDE AND NARROW BLOWERS AND EXHAUSTERS OF REVERSIBLE PATTERN.

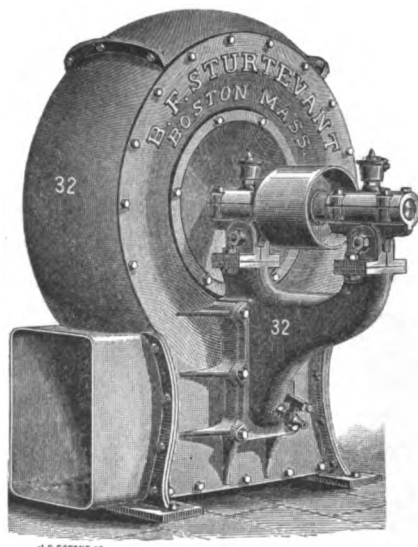
| Height of Wide Blower and Exhauster. | Height of Narrow Blower and Exhauster. | Diameter of Wide Blower and Exhauster. | Diameter of Narrow Blower and Exhauster. | Diam. of Inlet and Exhauster. | Diam. of Inlet and Exhauster. | Size of Outlet and Exhauster. | Size of Outlet and Exhauster. | Pulley for Wide Blower and Exhauster. | Pulley for Narrow Blower and Exhauster. | Price of Wide Blower and Exhauster. | Price of Narrow Blower and Exhauster. |
|--------------------------------------|--|--|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|---------------------------------------|---|-------------------------------------|---------------------------------------|
| 28 1/2 | 27 1/2 | 24 1/2 | 23 | 10 3/4 | 9 1/4 | 9 1/4 x 9 1/4 | 9 1/4 x 7 | 5 1/4 x 4 1/2 | 4 1/4 x 4 | \$ 55 | \$ 44 |
| 32 1/2 | 31 1/2 | 27 1/2 | 26 | 12 1/2 | 10 3/4 | 11 1/2 x 11 1/2 | 10 1/4 x 8 | 5 1/4 x 5 | 4 1/4 x 4 1/2 | 70 | 55 |
| 37 | 36 | 31 | 29 1/2 | 14 | 12 1/4 | 13 x 13 | 9 x 13 | 6 1/4 x 5 1/2 | 5 1/4 x 5 | 90 | 70 |
| 42 | 41 | 35 | 33 | 16 | 14 | 14 x 14 | 14 x 10 1/4 | 7 1/4 x 6 1/2 | 6 1/4 x 5 1/2 | 115 | 90 |
| 48 | 46 1/4 | 41 1/4 | 38 | 18 | 16 | 16 x 16 | 16 x 12 | 8 1/4 x 7 1/2 | 7 1/4 x 6 1/2 | 150 | 115 |
| 54 | 53 1/4 | 48 | 43 | 21 | 18 | 18 x 18 | 18 x 13 1/2 | 8 1/4 x 8 1/2 | 7 1/4 x 7 1/2 | 200 | 150 |
| 63 | 61 | 53 | 50 | 24 | 21 | 21 x 21 | 21 x 16 | 11 x 9 | 9 1/4 x 8 1/2 | 250 | 200 |
| 72 | 71 | 62 | 60 | 27 | 24 | 24 x 24 | 24 x 18 | 12 1/4 x 9 1/4 | 11 x 9 | 325 | 250 |
| 87 | 81 | 73 | 66 | 31 | 27 | 27 x 27 | 27 x 21 | 14 1/4 x 10 | 12 1/4 x 9 1/4 | 400 | 325 |
| 98 | 92 | 84 | 75 | 36 | 31 | 31 x 31 | 31 x 24 | 16 x 10 1/4 | 14 1/4 x 10 | 500 | 400 |
| 109 | 103 | 95 | 86 | 40 | 36 | 36 x 36 | 36 x 27 | 18 x 11 | 16 x 10 1/4 | 650 | 500 |
| 120 | 112 | 106 | 96 | 45 | 40 | 40 x 40 | 40 x 31 | 20 x 12 | 18 x 11 | 800 | 650 |
| 131 | 124 | 117 | 108 | 52 | 45 | 45 x 45 | 45 x 37 | 24 x 14 | 20 x 12 | 1000 | 800 |

The Sturtevant Blower and Exhauster.

MONOGRAM PATTERN.



Monogram Blower.



Monogram Exhauster.

THE Monogram Blower and Exhauster, illustrated above, are neatly and durably constructed, put together with bolts and nuts and readily accessible.

The Blower is peculiarly adapted to all situations where a large volume of air is required, and is recommended for use in connection with steam boilers, heating and puddling furnaces, forges, etc.

The Exhausting Fan is adapted to removing dust from emery wheels and other polishing tools; for taking away smoke and gas generated in smith shops, manufacturing establishments and chemical works, and steam or other vapor from paper machines, drying rooms,

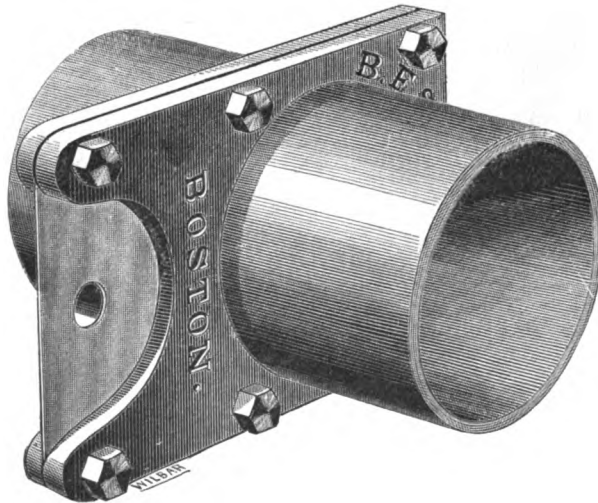
etc.; sweat from mill-stones, offensive odors from try-kettles and dyeing establishments; for ventilating mines and all underground works.

Air moving through pipes is retarded by the friction of its particles along the sides of the pipe, and the loss of pressure from this source increases directly according to the length of the pipe, and the square of the velocity of the moving air.

A diagram showing location of furnaces, air shafts, etc., is a great help in determining the requirements of our customers; also definite statements whether right or left hand (side pulley is on, when facing the outlet) blower or exhauster is required.

| No. | Square ft. Grate Surface. | Diameter of Inlet. | Diameter of Outlet. | Diameter of Pulley. | Face of Pulley. | Rev. per Min. | Cubic feet of Air per Min. | H. Power. | Price. |
|-----|---------------------------|--------------------|---------------------|---------------------|-----------------|---------------|----------------------------|-----------|--------|
| 00 | 5 | 5 | 4 | 2 $\frac{3}{4}$ | 2 | 3000 | 500 | ..... | \$20 |
| 0 | 6 | 5 $\frac{3}{4}$ | 4 $\frac{3}{4}$ | 3 | 2 $\frac{1}{4}$ | 2600 | 600 | ..... | 26 |
| 1 | 8 | 6 $\frac{1}{2}$ | 5 $\frac{3}{4}$ | 3 $\frac{1}{2}$ | 2 $\frac{1}{2}$ | 2200 | 764 | .60 | 32 |
| 2 | 10 | 7 $\frac{1}{2}$ | 6 $\frac{3}{4}$ | 3 $\frac{3}{4}$ | 2 $\frac{3}{4}$ | 1928 | 1019 | .79 | 44 |
| 3 | 14 | 9 | 9 | 4 $\frac{1}{4}$ | 3 $\frac{1}{2}$ | 1638 | 1427 | 1.11 | 55 |
| 4 | 20 | 10 $\frac{1}{2}$ | 10 $\frac{1}{2}$ | 5 | 4 $\frac{1}{2}$ | 1410 | 1936 | 1.51 | 70 |
| 5 | 27 | 12 | 12 | 6 | 5 | 1194 | 2701 | 2.10 | 90 |
| 6 | 36 | 14 | 14 | 7 | 6 | 1018 | 3699 | 2.86 | 115 |
| 7 | 48 | 16 | 16 | 9 | 7 $\frac{1}{2}$ | 878 | 4847 | 3.77 | 150 |
| 8 | 62 | 18 | 18 | 10 | 8 $\frac{1}{2}$ | 766 | 6115 | 4.76 | 200 |
| 9 | 80 | 21 | 21 | 12 | 9 $\frac{1}{2}$ | 671 | 8154 | 6.35 | 250 |

The Blast Gate.



THE construction of the Blast Gate may be readily understood from the above illustration: Its use is to open and close the air shaft, and to regulate the blast for furnaces, forges, etc.

The following schedule of prices gives measurements to outside of blast gate collar.

| | | | |
|---------------------------|--------|--------------------------|--------|
| 1½ in. (Composition)..... | \$1.25 | 4 in. (Composition)..... | \$2.75 |
| 2 " " | 1.50 | 5 " (Iron) | 2.75 |
| 2½ " " | 1.75 | 6 " " | 3.25 |
| 3 " " | 2.00 | 8 " " | 4.50 |
| | | 10 " " | 6.00 |
| | | 12 " " | 8.00 |
| | | 14 " " | 10.00 |
| | | 15 " " | 12.00 |
| | | 16 " " | 15.00 |
| | | 18 " " | 18.00 |
| | | 20 " " | 20.00 |
| | | 24 " " | 25.00 |

The Hot Blast Apparatus.

FOR the purpose of heating the air, a tubular drum is connected with the air shaft, the blast being driven through the tubes, which are surrounded by exhaust steam entering at one side of the drum and making its exit at the

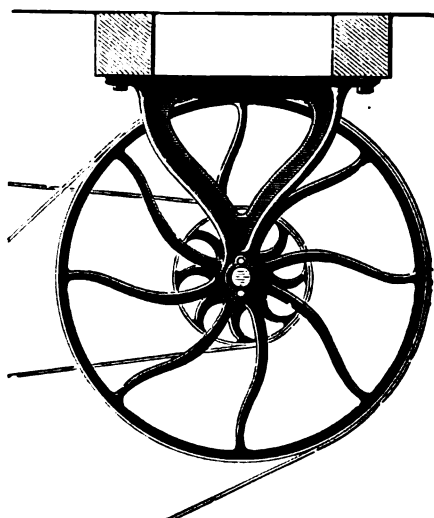
other side.

For drying lumber, brick, wool, cotton, cloth and hosiery; for corn and other grains, and for leather, glue, tobacco, etc., it is indispensable.

Counter-Shafts, Hangers, Etc.



Counter-Shaft, without Belt.



Counter-Shaft, with Belt.

IN ordering Counter-shafts, state what kind of Blower they are wanted for—the speed of main shaft, and the largest pulley that can be put on the same. The first column in list of Counter-shafts is the diameter of driving pulley or pulleys. The second column gives the different diameters of driven or main belt pulleys, which can be put on the same shaft.

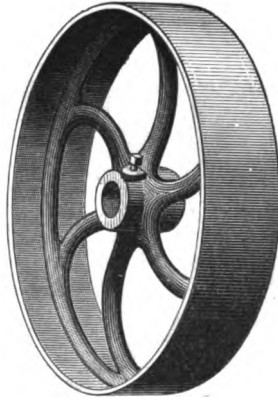
In ordering Blowers with Counter-shaft and Pulleys, the purchaser should always be particular to give speed of main line of shafting and the largest pulley which can be used thereon, so that pulleys may be sent to suit the circumstances of the case, as it is desirable to get as much speed as possible from main line. Always use as large a pulley as possible on Counter-shaft for main belt. All these Blowers and Exhausters (excepting Pressure

Blowers for cupola furnaces and forges), are built with one pulley to run with one belt (unless ordered for two belts). Pressure Blowers, from Nos 4 to 10 inclusive, for Cupola Furnaces and Forges, have two pulleys, and run with two belts.

PRICE LIST.

| Diameter of Driving Pulley. | Diameter of Pulley for Main Belt. | Diameter of Shaft. | Price, with Two Driving Pulleys. | Price, with One Driving Pulley. |
|-----------------------------|-----------------------------------|--------------------|----------------------------------|---------------------------------|
| 14 | 5½, 6 | 7 | \$ 10.00 | \$ 8.00 |
| 16 | 6, 7 | 1 | 12.00 | 10.00 |
| 18 | 7, 8 | 1½ | 15.00 | 12.00 |
| 21 | 7, 8, 9 | 1½ | 20.00 | 16.00 |
| 24 | 9, 10, 12 | 1½ | 25.00 | 22.00 |
| 28 | 10, 12, 14 | 1½ | 35.00 | 30.00 |
| 32 | 12, 14, 16 | 1½ | 46.00 | 40.00 |
| 36 | 12, 14, 16, 18 | 1½ | 60.00 | 50.00 |
| 42 | 14, 16, 18, 20 | 2 | 80.00 | 68.00 |
| 48 | 18, 20, 22, 24 | 2½ | 100.00 | 85.00 |
| 54 | 18, 20, 22, 24 | 2½ | 125.00 | 100.00 |

Pulleys.



WE are prepared to furnish Pulleys of modern and approved proportions, either rough as cast, or finished off complete, with Fastener Bolts, or Key Seats and Keys, as desirable.

Pulleys from six to thirty-six inches in diameter, increase by single inches, and from thirty-six to sixty inches in diameter, increase two inches on each successive size.

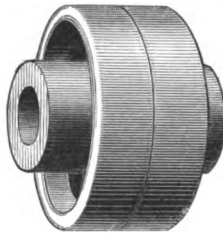
Larger sizes increase six inches to a num-

ber, but any size and proportions required will be made by us on receipt of order.

They can be made of any width wanted, either heavy or light, as may be desired. When extra width of face is required, we will make them with a double set of arms.

Also balance and band wheels in segments, of any weight, face and diameter. Loose Pulleys, with self-oilers and belt shifters, to suit any width of belt.

Couplings.



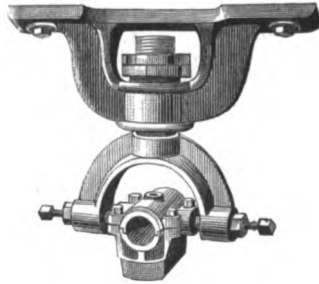
COUPLINGS to connect lines of shafting, of any size desired, can be supplied at short notice.

Bolts and Nuts and Key, complete, are supplied with them in number and size, proportioned to size of Couplings ordered.

Clutches.

OF ANY STYLE, WITH LEVERS TO OPERATE THEM, WILL BE FURNISHED TO ORDER.

Hangers.

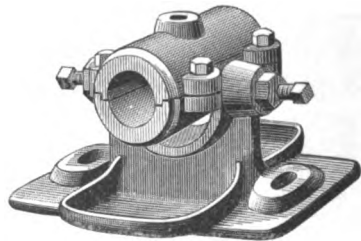
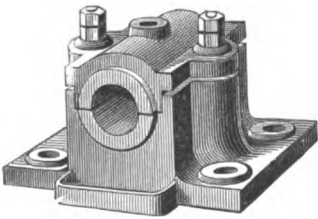


These Adjustable Hangers are neatly designed and well proportioned for strength in accordance with size of Shafting that is to be run in them.

ALL SHAFTING SEATS ARE CAREFULLY BABBITED.



Pillow Blocks.



THESE BEARINGS ARE

STATIONARY OR ADJUSTABLE,

As above, in every size to order,

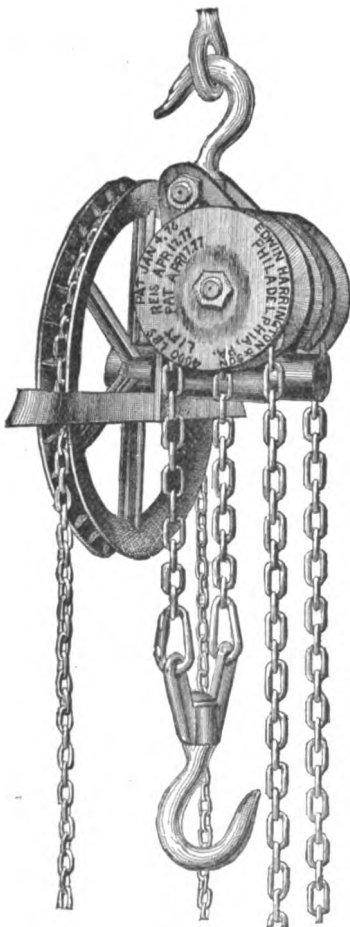
**AND PROPERLY PROPORTIONED, WITH BRASSES, OR BABBITED, AS DESIRABLE BY
THE USER, AND WITH OR WITHOUT OIL CUPS, AS ORDERED.**

**In ordering, besides size of Shafting, MUST BE GIVEN length and kind of Bolts
required to fasten.**

DIFFERENTIAL Chain Screw Hoisting Machine,

INDISPENSABLE FOR

| | |
|--|--|
| <p>Iron Foundries, Machine Shops, Stone Quarries, Stone Yards, Contractors, Carriage Shops, Bridge Builders.</p> | <p>Blacksmiths, Cotton Mills, Woolen Mills, Warehouses, Boiler Makers, House Builders.</p> |
|--|--|



THIS Hoist is not liable to accidents as it cannot run down.

The working and hoisting chains are independent, and cannot catch or clog.

The sheaves are made to fit the chain, the stretching of which, however, will not affect the working of the machine.

The load is held by two chains, making it doubly secure against slipping.

The pulleys being all on top of the hoist, the workman stands less chance of getting hurt.

The load can be raised higher and easier than with other hoists.

The hand chain is never under foot and can be readily removed when putting up machine.

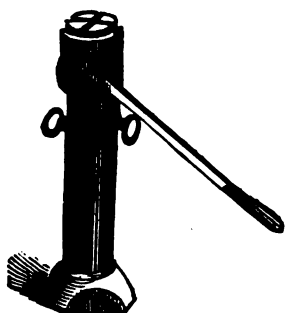
With a medium-sized hoisting machine 35 lbs. will raise, and 15 lbs. lower, 1,000 lbs.

SIZES AND CAPACITY.

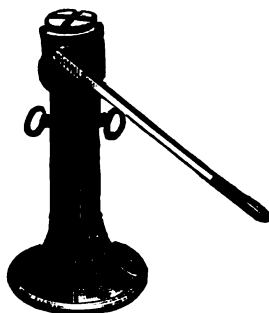
In ordering allow four feet of chain to each foot of lift.

| Weight of Machine. | Lift. | To raise. |
|--------------------|---------|-----------|
| 35..... | 8..... | 500 |
| 50..... | 8..... | 1,000 |
| 65..... | 8..... | 2,000 |
| 80..... | 8..... | 3,000 |
| 140..... | 9..... | 4,000 |
| 200..... | 10..... | 6,000 |
| 260..... | 10..... | 8,000 |
| 625..... | 12..... | 10,000 |
| 750..... | 12..... | 12,000 |
| 875..... | 12..... | 16,000 |
| 925..... | 12..... | 20,000 |

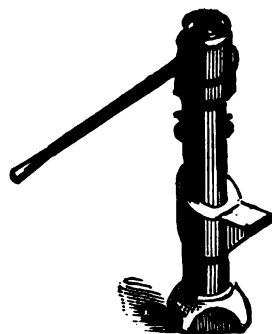
Hydraulic Jacks.



Plain Jack.



Broad Base.



Ground Lift.

THE Hydraulic Jack consists of a solid piston or ram sliding in a cylinder. A hand lever attached to the head of the ram works a small piston pump, which forces the fluid from a reservoir chamber into the space of the outside cylinder; this forces the ram out with great lifting power. Water, spirits or glycerine may be used for this purpose, the former only where there is no danger of freezing.

By a change of position of the hand lever a valve is operated to return the liquid to the reservoir chamber and allow the ram to drop back into the cylinder.

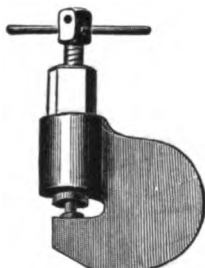
These Jacks are made from two to eight or more inches in diameter, according to the lifting power required. The ground lifting attachment is a tube screwed into the lower side of the head, passing down the outside to the bottom of the press, where a strong claw pro-

jects to support the weight to be raised. The Broad Base Jack is specially useful in lifting locomotives or other rolling stock, as it assures a firm foundation and prevents tipping.

They are light, portable and easy of application, a jack to raise four tons weighing about 50 lbs. The labor of one man is sufficient to work them, and will raise thirty tons one foot high in five minutes.

| Style of Jack, | To Lift or Press. Tons. | Run Out or Raise. Inches. | Price. |
|------------------|-------------------------------|---------------------------------|---------|
| Ground Lift..... | 4 | 12 | \$60.00 |
| "..... | 4 | 24 | 65.00 |
| Plain Jack..... | 7 | 12 | 70.00 |
| "..... | 7 | 24 | 75.00 |
| Broad Base..... | 7 | 12 | 80.00 |
| "..... | 7 | 18 | 85.00 |
| Ground Lift..... | 7 | 12 | 85.00 |
| "..... | 7 | 24 | 90.00 |
| Plain Jack..... | 10 | 12 | 80.00 |
| "..... | 10 | 18 | 100.00 |
| Broad Base..... | 10 | 12 | 95.00 |
| "..... | 10 | 18 | 110.00 |
| Ground Lift..... | 10 | 12 | 100.00 |
| Plain Jack..... | 15 | 12 | 100.00 |
| Broad Base..... | 15 | 12 | 125.00 |
| "..... | 15 | 18 | 150.00 |
| Ground Lift..... | 15 | 12 | 150.00 |

The Dudgeon Hydraulic Punch.



THE Hydraulic Punch illustrated on this page is particularly useful to boiler makers, machinists, iron ship builders, architectural iron workers, etc.

Where great punching power is required, with a limited amount of movement, the Hydraulic Punch is far superior to any mechanical arrangement that can be devised.

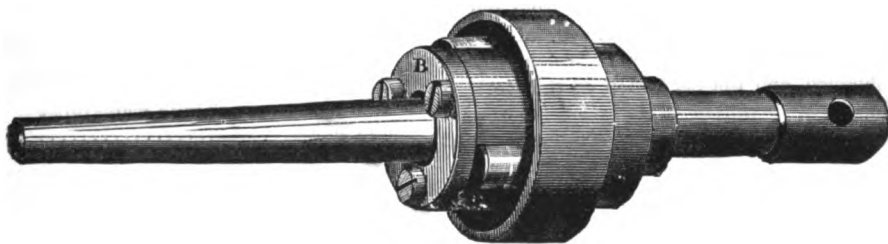
These punches will punch through three-eighths inch boiler iron, a five-eighths inch hole; and with one man to work it more work can be accomplished than by two men with the common hand-screw punch, besides being ap-

plicable in many places where a screw punch cannot be used.

They are simple in their construction, being without valves and not being worked by the force pump in common use on other hydraulic presses.

| | |
|---|-----------|
| To punch $\frac{1}{2}$ iron for $\frac{1}{2}$ rivets or bolts.. | \$ 70.00 |
| " " $\frac{3}{8}$ " " $\frac{3}{8}$ " " " | .. 80.00 |
| " " $\frac{1}{2}$ " " $\frac{1}{2}$ " " " | .. 100.00 |
| " " $\frac{3}{4}$ " " $\frac{3}{4}$ " " " | .. 120.00 |
| " " $\frac{1}{2}$ " " $\frac{1}{2}$ " " " | .. 150.00 |
| " " $\frac{3}{8}$ " " $\frac{3}{8}$ " " " | .. 200.00 |

The Dudgeon Tube Expander.



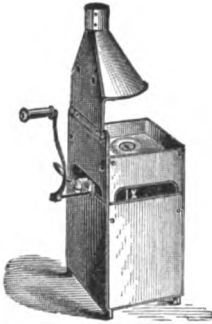
THE above Roller Tube Expander will be found to possess many advantages over those now in use. The tubes are expanded by gradual increase of pressure and without hammering, thus rendering them far less liable to crack. Leaky tubes may be tightened with perfect safety while boiler is in operation and under full head of steam.

One expander will answer for any thickness of tube sheet by simply shifting the position of the outside ring; this avoids the necessity of a separate expander for each dif-

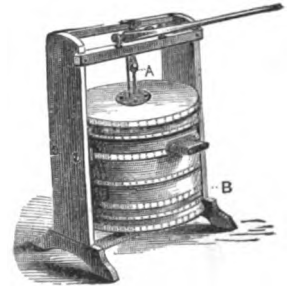
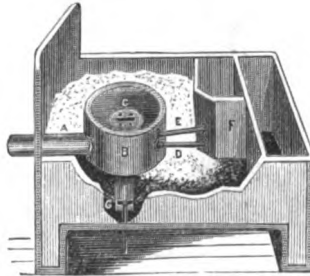
ferent thickness of tube sheet. We are prepared to furnish the following sizes; the dimensions given refer to the outside diameters of tubes to be expanded:

| | | | |
|-------------------------|---------|-------------------------|---------|
| 1 inch, | \$20.00 | 3 inch, | \$55.00 |
| 1 $\frac{1}{2}$ " | 20.00 | 3 $\frac{1}{2}$ " | 60.00 |
| 1 $\frac{1}{2}$ " | 20.00 | 3 $\frac{3}{4}$ " | 70.00 |
| 1 $\frac{3}{4}$ " | 25.00 | 4 " | 85.00 |
| 1 $\frac{3}{4}$ " | 25.00 | 4 $\frac{1}{2}$ " | 100.00 |
| 2 " | 30.00 | 5 " | 120.00 |
| 2 $\frac{1}{2}$ " | 35.00 | 6 " | 130.00 |
| 2 $\frac{1}{2}$ " | 42.00 | 7 " | 180.00 |
| 2 $\frac{3}{4}$ " | 48.00 | | |

Portable Forge and Bellows.



Forge and Tuyere.



Hurricane Bellows.
(LITTLE GIANT.)

THIS cut represents the Vertical Hot Blast and Water Tuyere and Forge, the principle of which is new. Instead of the blast passing through pipe A it takes a circle of the air chamber B, and enters the fire at a temperature of 300 degrees through nozzle C, which is a hollow casting filled with water from iron tank F, by pipe D, the steam generated in the nozzle is conveyed to the tank by pipe E.

The water protects the nozzle from burning, also from choking up, while a hot blast is constantly passing through it. The saving of time and fuel is great, and will pay for the Tuyere many times over in the course of the year, while its durability, which has been thoroughly proved, equals its economy. For welding purposes it is invaluable, from the uniformity, clearness, and softness of the heats, the rapidity and ease with which they are obtained, and the perfection of the work produced.

This Tuyere has been in use for the past ten years, has stood the test, and exceeds by far any made at the present time.

Portable Forge and Bellows.

This Portable Forge and Bellows is the very best thing in the market, and sold 30 per cent. cheaper than any other portable forge. For durability and economy they far surpass any heretofore invented.

The superiority of this Portable Forge consists principally in its combination with the "Hurricane" Double Acting Bellows and Hot Blast Tuyere. It will give twice the blast of any other forge now made. The handle working in a quarter circle saves the smith from stooping and exertion as in other forges with

the wheel and fan blast, the hood being double protects the smith's face from the heat of the fire.

They are especially adapted for railroad, ship and bridge builders, boiler, carriage and wagon makers, horse shoers, pipe fitters and locksmiths.

PRICE LIST OF TUYERES.

| | |
|---------------------------------|---------|
| No. 1. without water..... | \$ 3.00 |
| No. 2. " " | 5.00 |
| No. 3. " " | 7.00 |
| No. 4. " " | 9.00 |
| No. 3. with pipes and tank..... | 12.00 |
| No. 4. " " " " | 15.00 |

PRICE LIST OF FORGES WITH TUYERE.

| | |
|--|---------|
| No. 1. 28 inches [] the Tuyere without water | \$20.00 |
| No. 2. 36 inches [] the Tuyere with water pipes and tank..... | 30.00 |
| No. 3. For heavy work with water pipes and tanks..... | 35.00 |
| No. 4. For very heavy work with water, pipes and tanks..... | 45.00 |
| Horse shoers' forge with hood..... | 30.00 |

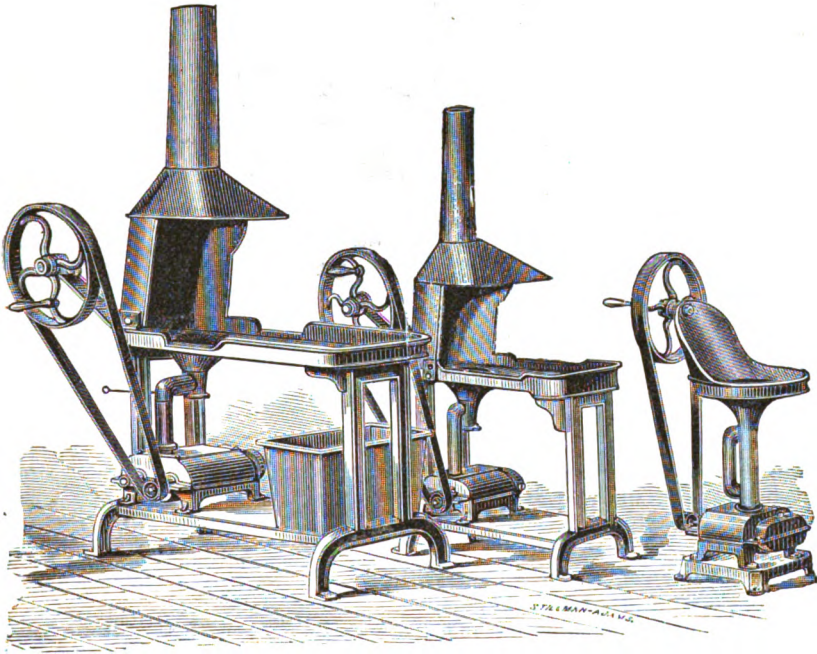
PRICE LIST OF HURRICANE BELLOWES.

| | |
|-----------------------|---------|
| No. 1. 21 inches..... | \$14.00 |
| No. 2. 24 " | 16.00 |
| No. 3. 27 " | 20.00 |
| No. 4. 30 " | 25.00 |
| No. 5. 32 " | 28.00 |
| No. 6. 34 " | 32.00 |

PRICE LIST OF PORTABLE FORGES.

| | |
|---|---------|
| No. 1. 15 inches square and 15-inch bellows | \$18.00 |
| No. 2. 22 inches square, and 20-inch bellows..... | 25.00 |
| No. 3. 28 inches square, and 24-inch bellows..... | 33.00 |

Root's Rotary Hand Blowers.



THESE Blowers are made to go behind any forge in place of the old fashioned perishable leather bellows.

The advantages of our little Hand Blower for smiths' shops are:

Its great durability—being made of iron. Economy of room—only occupying about 18 inches square. Producing a force blast that can be instantly varied from the slightest breath to the strongest blast. Great saving of coal. More work can be done with the Blower than with the bellows. Operated more easily and pleasantly than the bellows; can be run by hand or power, and connected with any Tuyere.

No. $\frac{1}{2}$ Blacksmith Hand Blower will furnish ample blast for one ordinary fire, by hand or by power; gives $\frac{1}{2}$ cubic foot of air each revolution. . . . \$43.00

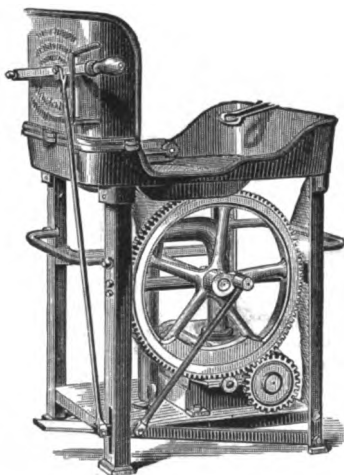
No. 1. Blacksmith Hand Blower will furnish ample blast for a large fire by hand, or two by power; gives $\frac{1}{2}$ cubic foot of air each revolution . . . \$53.00

No. 2. Blacksmith Hand Blower will furnish ample blast for one largest class fire by hand, or three by power; gives $\frac{3}{4}$ cubic foot of air each revolution. . . . 75.00

No. 3. Blacksmith Power Blower will furnish blast for five fires; gives $1\frac{1}{2}$ cubic foot of air each revolution.

To Operate.—Set the Blower perfectly level, on a solid foundation; see that all the feet touch before screwing down; pipe with metal pipe full as large as the opening in the Blower, with round turns or elbows, entering the Tuyere as large as possible; see that it is tight; turn slow, 20 to 50 revolutions per minute of upper wheel.

Root's Improved Portable Forge.

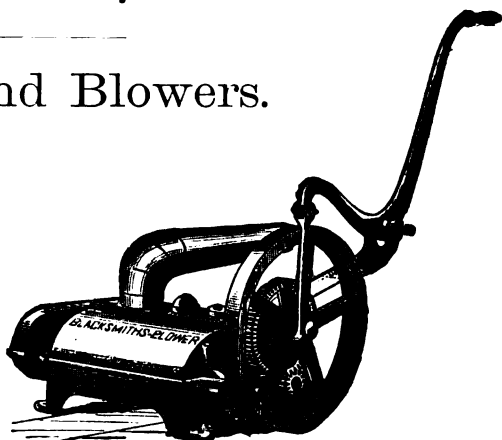
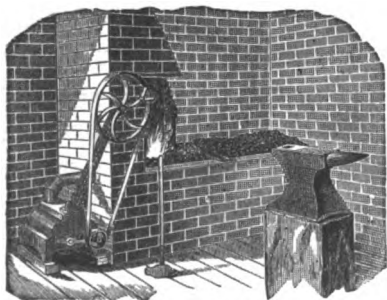


HITHERTO, in making Forges portable, the bellows have been so diminished, and the blast so reduced, as to be of little practical value. The blast to our Forge is produced by a Rotary Hand Blower (can be run by hand or power), and in combination with our Improved Tuyere makes the most complete forge in use for such purposes as portable forges are generally used for. They have all the convenience and working capacity for smithing, from the lightest to the heaviest, and yet occupy less than one-third the room of the common brick forge with the leather bellows attached. A workman with our Forge can turn off one-fourth more work than with the old style forge and bellows. They can be placed just where wanted, ready for use, thus saving the expense of brick, mortar, mason work, tuyeres and bellows. The forges and hoods, being made

of wrought and cast iron, are the strongest and most substantial portable forges ever manufactured.

| | |
|---|----------|
| No. 1. Portable Forge, with 14 by 20 inch hearth, and blast equal to 24 inch bellows..... | \$ 48.00 |
| No. 2. Portable Forge, with 14 by 20 inch hearth, and blast equal to 30 inch bellows..... | 59.00 |
| No. 3. Portable Forge, with 20 by 30 inch hearth, and blast equal to 36 inch bellows..... | 82.00 |
| No. 4. Portable Forge, with 36 by 42 inch hearth, and blast equal to 40 inch bellows..... | 110.00 |
| No. 5. Portable Forge, with 36 by 60 inch hearth, and blast equal to 50 inch bellows..... | 195.00 |
| Foot treadle attachment to crank wheel..... | 5.00 |
| Wheels at one end of forge stand, for easy locomotion..... | 5.00 |

Root's Hand Blowers.



The Trenton Anvil.

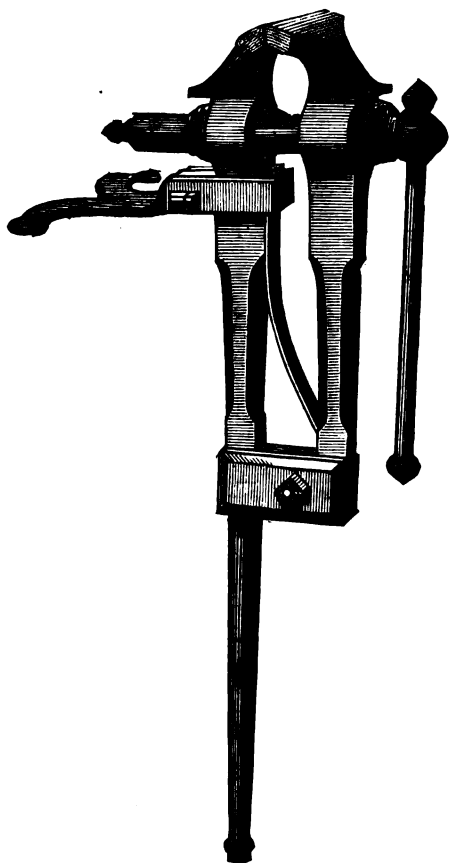


OUR Anvils are made of solid wrought iron with steel face, and are warranted as being first-class throughout. The price of anvils is subject to change with the market rates of iron, and consequently we cannot give a definite list of prices for our various sizes, but we give the advance on special sizes above and

below the average of from 85 to 250 lbs., as follows:

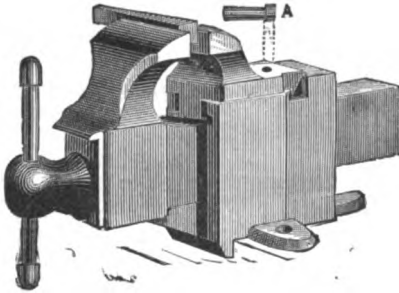
| | | | |
|--------------------|-----------------|---|---|
| From 40 to 50..... | 4 cents per lb. | | |
| " 50 " 60..... | 3 | " | " |
| " 60 " 70..... | 2 | " | " |
| " 70 " 84..... | 1 | " | " |
| Over 250 lbs..... | 1 | " | " |

Blacksmiths' Solid Box Vice.

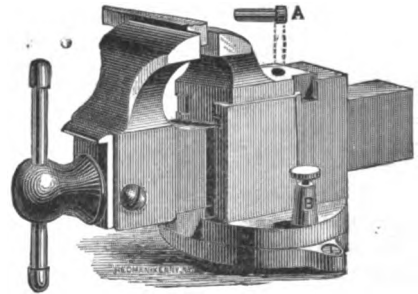


| Size of Jaws. | Weight. | Price. |
|-----------------------------|----------------|---------|
| 8 $\frac{1}{2}$ inches..... | 80 pounds..... | \$10.00 |
| 4 " | 35 " | 8.50 |
| 4 $\frac{1}{2}$ " | 40 " | 9.50 |
| 4 $\frac{1}{2}$ " | 45 " | 10.00 |
| 4 $\frac{1}{2}$ " | 50 " | 11.00 |
| 5 " | 55 " | 12.00 |
| 5 " | 60 " | 13.00 |
| 5 $\frac{1}{2}$ " | 65 " | 14.00 |
| 5 $\frac{1}{2}$ " | 70 " | 15.00 |
| 5 $\frac{1}{2}$ " | 75 " | 16.00 |
| 5 $\frac{1}{2}$ " | 80 " | 17.50 |
| 5 $\frac{1}{2}$ " | 85 " | 18.50 |
| 5 $\frac{1}{2}$ " | 90 " | 20.00 |
| 6 " | 95 " | 21.00 |
| 6 " | 100 " | 22.00 |
| 6 " | 105 " | 23.00 |
| 6 " | 110 " | 24.00 |
| 6 " | 115 " | 25.00 |
| 6 $\frac{1}{2}$ " | 120 " | 26.00 |
| 6 $\frac{1}{2}$ " | 125 " | 27.50 |
| 6 $\frac{1}{2}$ " | 130 " | 29.50 |
| 6 $\frac{1}{2}$ " | 135 " | 31.50 |
| 7 " | 140 " | 33.00 |
| 7 " | 145 " | 35.00 |
| 7 " | 150 " | 36.00 |
| 7 $\frac{1}{2}$ " | 160 " | 41.50 |
| 7 $\frac{1}{2}$ " | 170 " | 44.50 |
| 7 $\frac{1}{2}$ " | 180 " | 47.00 |
| 7 $\frac{1}{2}$ " | 190 " | 53.00 |
| 8 " | 200 " | 56.00 |

The Prentiss Vice.



Plain.



On Swivel.

THE back jaw of this Vice is adjustable, and conforms itself to any angle, firmly holding straight or beveled objects with equal security.

This jaw rests and works upon and against the solid body of the vice, thereby rendering it absolutely as strong and durable as the old style of permanent jaw; by the insertion of the pin shown in the cut it can be rendered positively fixed to the vice and perfectly parallel to the front jaw.

The mechanism at the swivel bottom is such as to render it fully as strong and firm as the stationary and solid bottom, while it renders the whole vice adjustable to any angle with the work table, by simply raising the ratchet pin on the side of the vice; this when released is forced back by a spring and holds the vice as strong and firm as if stationary.

We can also supply a patent pipe grip to fit these vices; the grip being brought together by the jaws of the vice holds the pipe firmly and securely in any required position.

A clamp to secure the vice to a table or work bench can be ordered to fit any size of vice.

SIZES, WEIGHTS AND PRICES OF Machinists' Vices.

| Width of Jaw. | Opens. | Adjustable Jaw and Stationary Bottom. | | Adjustable Jaw and Swivel Bottom. | | Stationary Jaw and Swivel Bottom. | |
|------------------|--------|--|-------|--|-------|--|-------|
| | | In. | Lbs. | Dolla. | Lbs. | Dolla. | Lbs. | Dolla. |
| 3 | 5 | 27 | 7.00 | 31 | 8.00 | .. | ... |
| 4 | 7 | 53 | 10.50 | 64 | 12.50 | 60 | 10.50 |
| 5 | 8 | 95 | 17.00 | 108 | 19.00 | 100 | 17.00 |
| 6 | 9 | 148 | 24.00 | 167 | 27.00 | 160 | 24.00 |
| 7 | 11 | 180 | 30.00 | 201 | 35.00 | .. | ... |

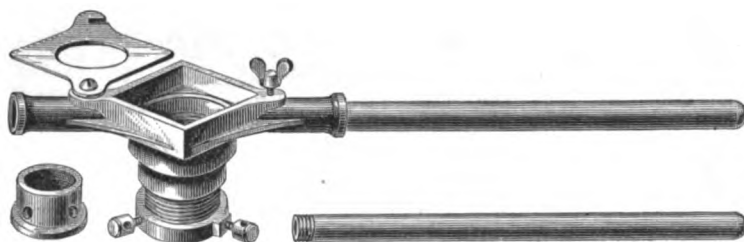
SIZES, WEIGHTS AND PRICES OF Model Makers' Vices.

| Width of Jaw. | Jaws open. | Adjustable Jaw and Stationary Bottom. | | Adjustable Jaw and Swivel Bottom. | | Vice Clamp for Table. |
|---------------|------------|---------------------------------------|---------|-----------------------------------|---------|-----------------------|
| | | In. | Weight. | Price. | Weight. | Price. |
| 1 3/4 | 1 3/4 | 2 | 2 | \$ 3.50 | 2 3/4 | \$ 4.50 |
| 2 | 2 | 3 1/2 | 4.00 | 4 3/4 | 5.00 | \$0.75 |
| 2 3/4 | 3 1/4 | 13 | 5.50 | 17 | 6.75 | 0.85 |
| 3 1/4 | 4 1/4 | 28 | 7.00 | 32 | 8.50 | 1.50 |
| 4 1/4 | 6 | 54 | 10.50 | 65 | 12.50 | 2.00 |
| | | | | | | 2.50 |

The Challenge Pipe Grip.

| Size of Vice. | Size of Pipe. | Price of Grip. |
|---------------|--------------------|----------------|
| 3 inches | 1/4 x 1 1/2 inches | \$ 3.00 |
| 3 1/2 " | 1/4 x 1 3/4 " | 3.00 |
| 4 " | 1/2 x 2 " | 4.00 |
| 4 1/2 " | 1/2 x 2 3/4 " | 4.00 |
| 5 " | 3/4 x 3 1/2 " | 5.50 |
| 6 " | 1 x 4 3/4 " | 6.50 |

Steam Fitters' Tools.



Malleable Iron Stocks.

THESE Stocks are made with wrought iron handles, which unscrew for convenience in packing. They are strongly made, of the best material, and thoroughly finished.

The stock illustrated above is with leader screw, and the prices we give include solid steel dies for pipe-sizes given:

| No. | Price. |
|--|---------|
| 3. For $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ inch pipe..... | \$ 7.00 |
| 4. " $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1 inch pipe. | 10.50 |
| 5. " $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 and 1 inch pipe..... | 12.50 |
| 6. " $1\frac{1}{4}$, $1\frac{1}{2}$ and 2 inch pipe..... | 15.00 |
| 7. " 1, $1\frac{1}{2}$, $1\frac{1}{2}$ and 2 inch pipe.. | 18.00 |
| Dies $\frac{1}{2} \times 2$ inch square, for No. 3 | \$1.25 |
| " $\frac{3}{4} \times 2\frac{1}{4}$ " " " " 4..... | " |
| " $\frac{1}{2} \times 2\frac{1}{2}$ " " " " 5..... | 1.75 |
| " 1x4 " " " " 6..... | " |
| " 1x4 " " " " 7..... | 3.00 |

Stanwood's Pipe Cutter.

| No. | Price. |
|--|-----------|
| 1. Cuts $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$ inch pipe..... | \$ 3.00 |
| 2. " 1, $1\frac{1}{4}$, $1\frac{1}{2}$ and 2 inch pipe..... | 4.50 |
| 3. " $2\frac{1}{2}$, 3 and 3 $\frac{1}{2}$ inch pipe..... | 16.00 |
| Steel Face, for No. 1..... | \$3.50 |
| " " " " 2..... | 5.00 |
| Extra Cutters, for No. 1 | 15 cents. |
| " " " " 2..... | 20 " |
| " " " " 3..... | 30 " |

Saunders' Pipe Cutter.

The tube is encircled by friction rollers, and all wearing surfaces are made of hardened steel. It is warranted to cut iron, brass or copper tubing in the smoothest and cleanest manner.

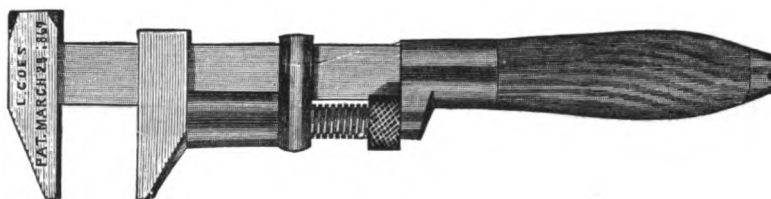
| No. | Price. |
|--|-----------|
| 1. Cuts from $\frac{1}{8}$ to 1 inch pipe..... | \$ 6.50 |
| 2. " " 1 " 2 " " | 8.00 |
| 3. " " 2 " 3 " " | 16.00 |
| Extra Knives, for No. 1..... | 20 cents. |
| " " " " 2..... | 30 " |
| " " " " 3..... | 40 " |

Stanwood's Pipe Cutter.



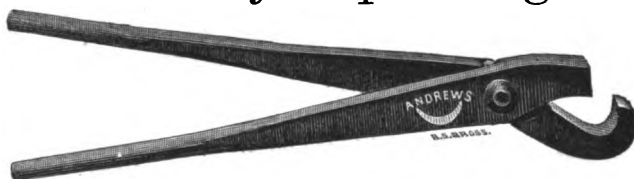
Saunders' Pipe Cutter.

Patent Screw Wrench.



| | | | | | | | |
|----------------------------|--------|---------|---------|---------|---------|---------|---------|
| Length of Wrench..... | 6 | 8 | 10 | 12 | 15 | 18 | 21 |
| Price, Black.....per doz., | \$9.00 | \$10.00 | \$12.00 | \$14.00 | \$24.00 | \$30.00 | \$36.00 |
| " Polished | 10.00 | 11.00 | 14.00 | 16.00 | 26.00 | 32.00 | 38.00 |

Ordinary Pipe Tongs.



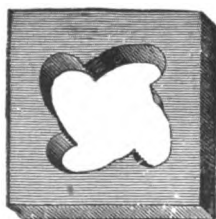
| | | | | | | | | | | | | | | |
|----------------------|------|------|------|------|------|------|-------|-------|------|-------|------|-------|------|---------|
| Size of Pipe..... | 1/8 | 1/4 | 3/8 | 1/2 | 5/8 | 1 | 1 1/4 | 1 1/2 | 2 | 2 1/2 | 3 | 3 1/2 | 4 | Inches. |
| Length of Tongs..... | 0.60 | 0.70 | 0.80 | 0.95 | 1.15 | 1.40 | 1.70 | 2.00 | 2.50 | 3.00 | 3.75 | 4.75 | 6.00 | Inches. |
| Price | | | | | | | | | | | | | | \$ cts. |

Patent Chain Pipe Wrench.



| | | | | | | |
|----------------------|------|---------|------|---------|-------|---------|
| Size, Number..... | 2 | 3 | 4 | 5 | 6 | Number. |
| Length of Lever..... | 27 | 36 | 48 | 60 | 72 | Inches. |
| Average Weight..... | 7 | 12 | 24 | 33 | 50 | Pounds. |
| Size of Pipe..... | 1:2 | 1 1/2:4 | 2:6 | 2 1/2:8 | 4:10 | Inches. |
| Price | 5.50 | 6.25 | 9.00 | 12.50 | 16.00 | \$ cts. |

Solid Pipe Dies and Pipe Taps.



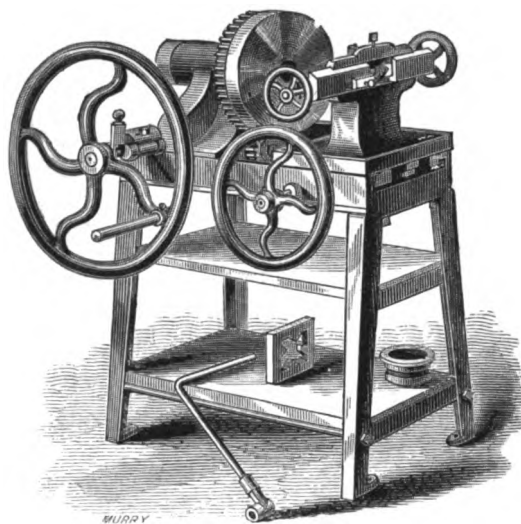
Solid Pipe Die.

| | | | | | |
|------------------|--------------------|-----------------------------------|----------|-----------|---------|
| Dimensions..... | 1/2 x 2 | 3/4 x 2 1/4 | 1 x 4 | 1 1/4 x 5 | Inches. |
| Pipe Sizes..... | 1/8, 1/4, 3/8, 1/2 | 5/8, 3/4, 7/8, 1, 1 1/4, 1 1/2, 2 | 2 1/2, 3 | | Inches. |
| Price, each..... | 1.25 | 1.75 | 8.00 | 10.00 | \$ cts. |



Pipe Tap..

Pipe Cutting Machine.



THIS Machine is intended for cutting lengths of pipe, and for cutting screw threads; it can be worked either by hand or power, and can be furnished of the following sizes:

No. 1. Cuts and screws from $\frac{1}{4}$ to 2 inch pipe; universal chuck; fly wheel; dies and sockets for nipples.

Hand machine.....\$175
Power machine..... 210

No. 2. Cuts and screws from $\frac{1}{4}$ to 2 inch pipe; counter-shaft and bushings complete.

Power machine.....\$350
To work by hand or power..... 380

No. 3. Cuts and screws from $\frac{1}{4}$ to 3 inch pipe; solid dies, $\frac{1}{4}$ to 2 inch; cutter dies, $2\frac{1}{4}$ and 3 inch; counter-shaft and bushings complete.

Power machine.....\$500
To work by hand or power..... 580

No. 4. Cuts and screws from 1 to 4 inch pipe; solid dies, 1 to 2 inch; cutter dies $2\frac{1}{4}$ to 4 inch; counter-shaft complete.

Power machine.....\$590
To be worked by hand or power..... 620

No. 5. Cuts and screws from $1\frac{1}{4}$ to 6 inch pipe; solid dies, $1\frac{1}{4}$ to 2 inch; cutter dies $2\frac{1}{4}$ to 6 inch; counter-shaft complete.

Power machine... ..\$1,000

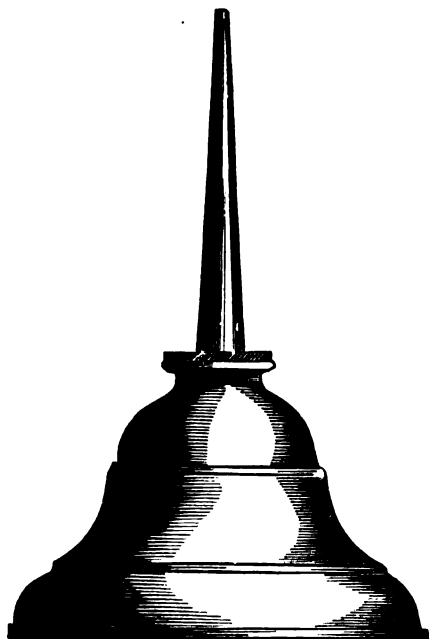
No. 6. Cuts and screws from $2\frac{1}{2}$ to 8 inch pipe; cutter dies; counter-shaft complete.

Power machine.....\$1,400

Attachments fitted to these machines for screwing bolts and tapping nuts, $1\frac{1}{2}$ inch or smaller, must be separately ordered.

Power machines with open dies furnished at special rates.

Oilers and Oiler Sets.



Common Oiler.—Zinc or Brass.

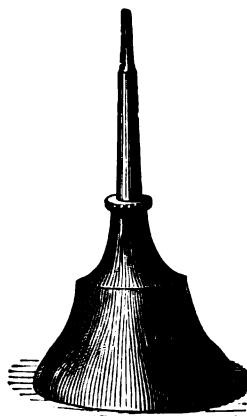
SIZES, Nos. 1, 2, 3, 4.

| | | | | | | |
|-----------------------|--------|--------|--------|--------|--------|--------|
| Number | 1 | 2 | 3 | 4 | 5 | 6 |
| Brass or Copper } per | \$3.50 | \$4.00 | \$5.00 | \$6.00 | \$7.00 | \$9.00 |
| Zinc } doz | 2.25 | 2.75 | 3.25 | 4.00 | 4.75 | 5.00 |

BROUGHTON'S PATENT OILERS.

Double Bottom.

| | | | | | |
|--------------------|--------|--------|--------|--------|--------|
| Number | 1 | 2 | 3 | 4 | 5 |
| Zinc, per doz..... | \$2.00 | \$3.00 | \$4.00 | \$5.50 | \$7.00 |
| Brass | 3.00 | 4.00 | 5.00 | 6.50 | 8.00 |



Malleable Iron Oiler.

ONLY ONE SIZE.

Malleable Iron Oilers..... per doz., \$5.00

OILER SETS.

| | | |
|--------------------|---------|---------|
| Number | 1 | 2 |
| Brass | \$16.00 | \$12.00 |
| Nickel-Plated..... | 21.00 | 16.00 |

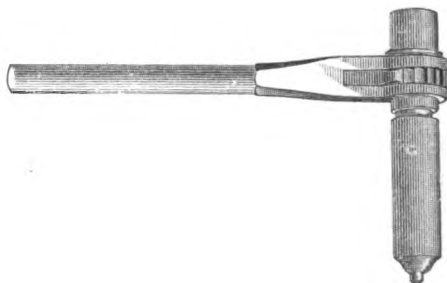
COPPER OILERS.

| No. | | Per Doz. |
|-----|----------------------------|----------|
| 1. | One pint, Short Tube..... | \$23.00 |
| 2. | “ “ Long “ | 24.00 |
| 3. | One quart, Short Tube..... | 25.00 |
| 4. | “ “ Long “ | 26.00 |

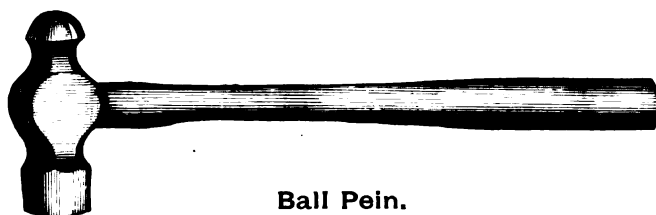
Ratchet Drill.

PRICES.

| No. | | Price. |
|-----|-----------------------------|---------|
| 1. | Handles 10 inches long..... | \$10.50 |
| 2. | “ 12 “ “ | 13.50 |
| 3. | “ 15 “ “ | 16.00 |
| 4. | “ 17 “ “ | 19.00 |
| 5. | “ 20 “ “ | 23.00 |



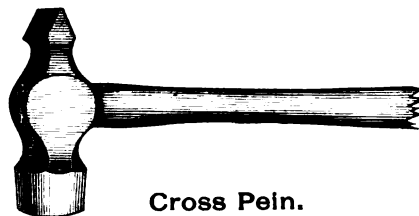
Machinists' Hammers.



Ball Pein.



Straight Pein.

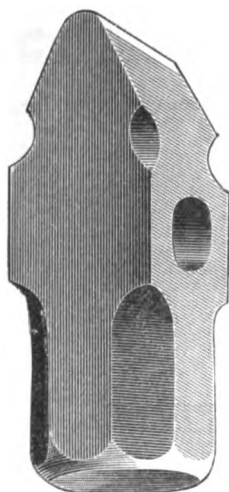


Cross Pein.

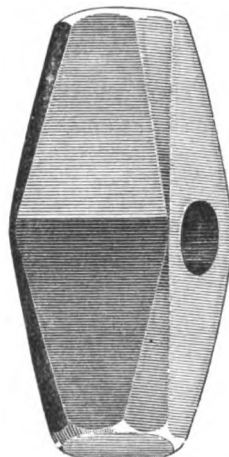
MACHINISTS' HAMMERS.

Price, per Dozen.

| | | |
|-------------------|-------|---------|
| 1 pound, 0 ounces | ..... | \$11.00 |
| 1 " 4 " | ..... | 18.00 |
| 1 " 8 " | ..... | 14.00 |
| 1 " 14 " | ..... | 16.00 |
| 2 " 3 " | ..... | 18.00 |
| 2 " 8 " | ..... | 20.00 |
| 2 " 12 " | ..... | 22.00 |
| 3 " 0 " | ..... | 24.00 |
| 3 " 5 " | ..... | 26.00 |
| 3 " 12 " | ..... | 28.00 |



Sledge.



Striker.

SLEDGES.

Straight or Cross Pein.

| | | |
|-----------------|----------------|-----------|
| Linsey, or Atha | per lb., | 30 cents. |
| Excelsior | " 25 " | |

STRIKING HAMMERS.

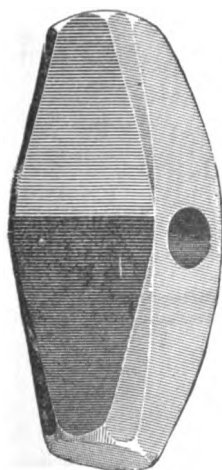
Weight, from 5 to 18 lbs.

| | | |
|-----------------|----------------|-----------|
| Linsey, or Atha | per lb., | 30 cents. |
| Excelsior | " 25 " | |

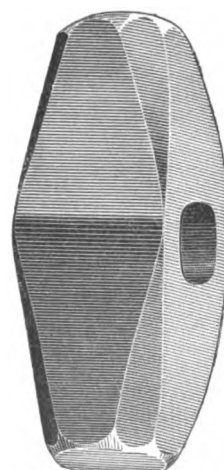
MINERS' STONE HAMMERS.

Weight, from 2½ to 5 lbs.

| | | |
|------------------|-------|-----------|
| Price, per pound | | 36 cents. |
|------------------|-------|-----------|



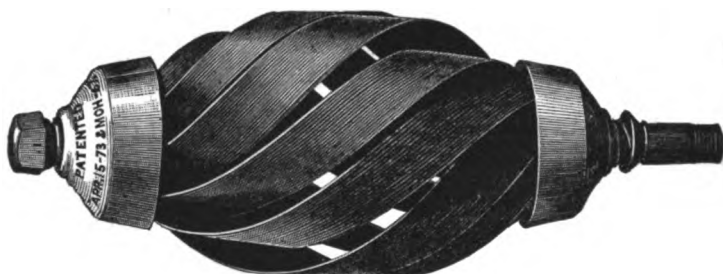
Miners' Hammer.



Stone Hammer.

Patent Boiler Tube Scraper.

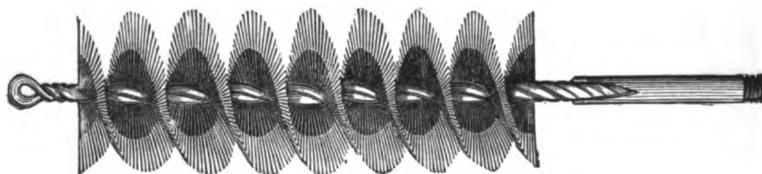
TO FIT FROM ONE TO FOUR INCH TUBES



| | | | | | | | | | | |
|-------------------|------|-------|-------|-------|------|-------|-------|-------|------|---------|
| Size of Tube..... | 2 | 2 1/4 | 2 1/2 | 2 3/4 | 3 | 3 1/4 | 3 1/2 | 3 3/4 | 4 | Inches. |
| Price..... | 2.00 | 2.25 | 2.50 | 2.75 | 3.00 | 3.25 | 3.50 | 3.75 | 4.00 | \$ cts. |

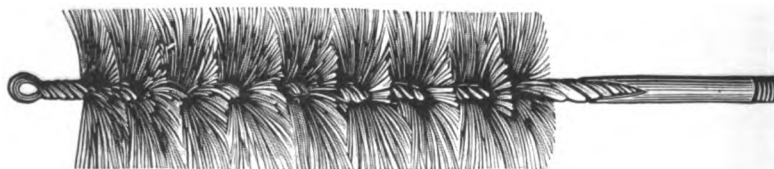
The smallest size will fit from one to two inch tubes. Sizes over four inches, \$1.25 per inch diameter of tube.

Steel Wire Tube Brush.



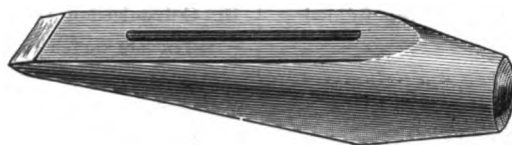
| | | | | | | | | | | | | |
|---------------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|------|---------|
| Diameter..... | 1 1/4 | 1 1/2 | 1 3/4 | 2 | 2 1/4 | 2 1/2 | 2 3/4 | 3 | 3 1/4 | 3 1/2 | 4 | Inches. |
| Price..... | 1.00 | 1.00 | 1.10 | 1.25 | 1.40 | 1.50 | 1.60 | 1.75 | 2.00 | 2.25 | 2.50 | \$ cts. |

Whalebone Tube Brush.



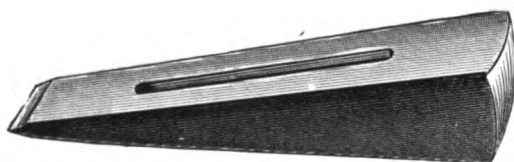
| | | | | | | | | | | | | |
|---------------|-------|-------|-------|-----|-------|-------|-------|------|-------|-------|------|---------|
| Diameter..... | 1 1/4 | 1 1/2 | 1 3/4 | 2 | 2 1/4 | 2 1/2 | 2 3/4 | 3 | 3 1/4 | 3 1/2 | 4 | Inches. |
| Price..... | .75 | .75 | .80 | .90 | 1.00 | 1.10 | 1.25 | 1.40 | 1.50 | 1.75 | 2.00 | \$ cts. |

Improved Steel Wedges.



CALIFORNIA PATTERN.

Solid Cast Steelper pound, 22 cents.

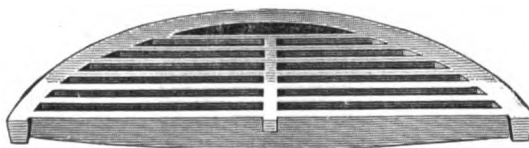


NEW YORK PATTERN.

Solid Steel.....per pound, 11 cents.

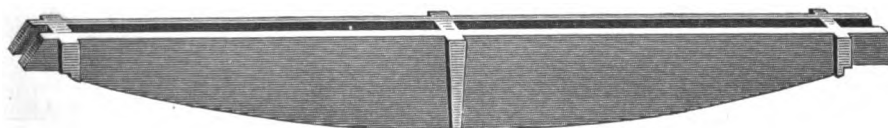


Fire Grates and Grate Bars.



We are prepared to make fine Grates of any size and shape—round, half round or square—to fit steam boilers and furnaces of various kinds.

Single and double grate bars can be had of any length and width, made extra deep for heavy fires under large steam generator and cupola furnaces.



Cast Iron Steam Fittings.

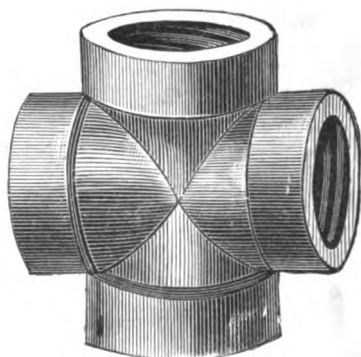
OUR Cast Iron Pipe Fittings are made plain or galvanized, and consist of the following pieces :

Crosses.
Plugs.
Reducers.
Couplings, plain, right and left.
Nipples, long and close.
Lock Nuts.
Elbows, 45° and 90°, wrought or cast iron.
Tees.
Y Branches.
Wrought Iron Bends.
Unions, in brass or iron.
Bushings.
Long Screws.
Caps.
Return Bends, open and closed.

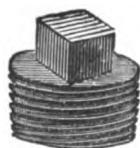
All cut with standard screw thread to fit the regular sizes of wrought iron pipe.

Prices of Iron Fittings about average of 12 cents per lb. ; Galvanized, 18 cents per lb.

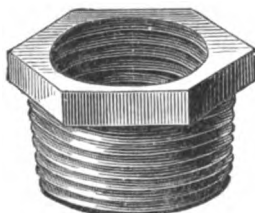
Malleable Iron Fittings average 14 cents per lb. ; Galvanized or Tinned, extra, 6 cents per lb.
All orders under 25 lbs., 10 % extra.



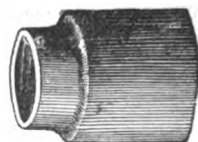
Cross.



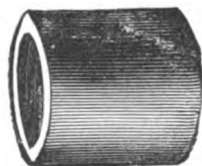
Plug.



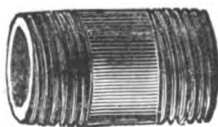
Reducer.



Reducer.



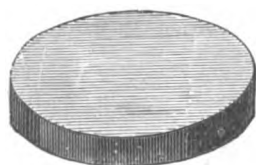
Coupling.



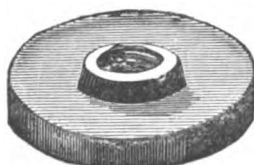
Long Nipple.



Close Nipple.



Flange.—Blank.



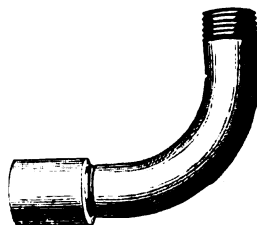
Flange.



Lock Nut.

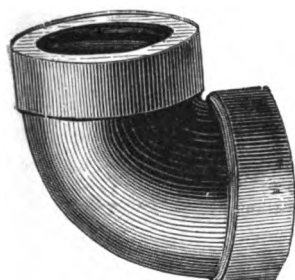


Wrought Iron Pipe and Coupling.

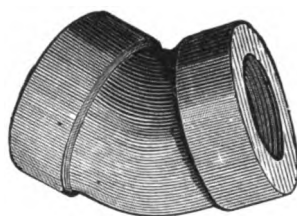


Wrought Iron Elbow.

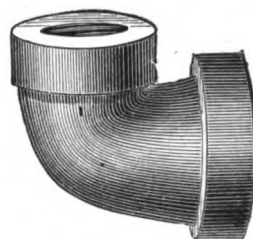
Cast Iron Steam Fittings.



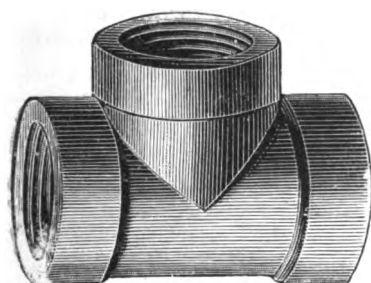
Elbow.



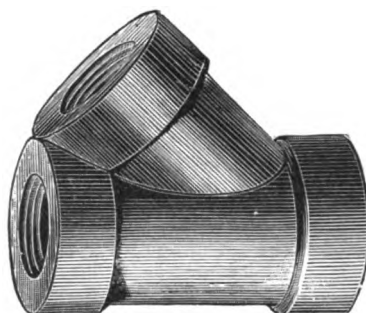
45° Elbow.



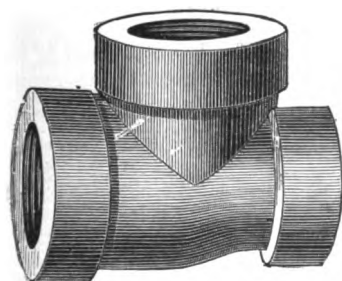
Reducing L.



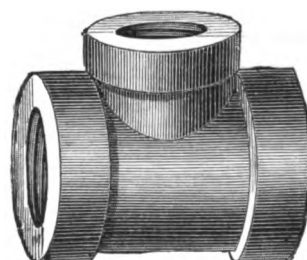
Tee.



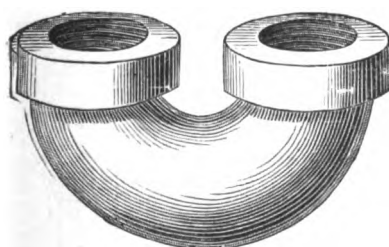
Y Branch.



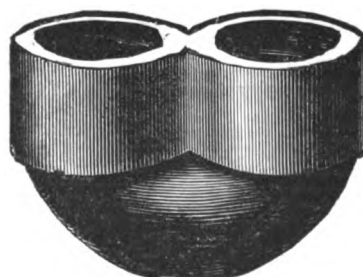
Reducing Tee.



Reducing Tee.



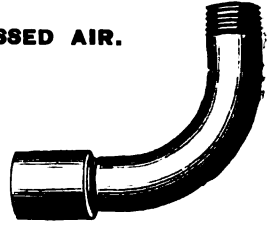
Return Bend.—OPEN.



Return Bend.—CLOSED.

Wrought Iron Pipe,

FOR STEAM, GAS, WATER, OR COMPRESSED AIR.



THIS Pipe is furnished plain, galvanized and rubber coated. It is tested by hydraulic pressure, at 300 pounds to the square inch for

pipe less than $1\frac{1}{2}$ inch inside diameter, (butt welded), and at 500 pounds for $1\frac{1}{2}$ inch pipe and larger (lap welded.)

| Inside Diameter. | Weight per Ft. | Price, Plain. | Price, Galv'd. | Inside Diameter. | Weight per Ft. | Price, Plain. | Price, Galv'd. | Inside Diameter. | Weight per Ft. | Price, Plain. | Price, Galv'd. |
|------------------|----------------|------------------|----------------|------------------|----------------|---------------|----------------|------------------|----------------|---------------|----------------|
| Inches. | Lbs. | Cts. | Cts. | Inches. | Lbs. | \$ cts. | \$ cts. | Inches. | Lbs. | \$ cts. | \$ cts. |
| $\frac{1}{8}$ | .24 | 8 | .. | $1\frac{1}{2}$ | 2.69 | .38 | .47 | 5 | 14.56 | 2.25 | 3.00 |
| $\frac{1}{4}$ | .42 | 8 | 11 | 2 | 3.66 | .46 | .64 | 6 | 18.78 | 2.75 | 4.00 |
| $\frac{3}{8}$ | .56 | 9 | 12 | $2\frac{1}{4}$ | 5.77 | .75 | 1.00 | 7 | 23.00 | 3.75 | .. |
| $\frac{1}{2}$ | .85 | 11 | 15 | 3 | 7.55 | .95 | 1.30 | 8 | 28.00 | 4.75 | .. |
| $\frac{5}{8}$ | 1.13 | 13 $\frac{1}{2}$ | 19 | $3\frac{1}{4}$ | 9.05 | 1.25 | 1.70 | 9 | 34.40 | 6.50 | .. |
| 1 | 1.67 | 19 | 28 | 4 | 10.78 | 1.50 | 2.05 | 10 | 40.64 | 8.00 | .. |
| $1\frac{1}{4}$ | 2.25 | 27 | 40 | $4\frac{1}{4}$ | 12.50 | 1.75 | 2.40 | 12 | 54.65 | 12.00 | .. |

Extra Strong Wrought Iron Pipe,

FOR OIL, GAS, SALT, OR ARTESIAN WELLS.

| Inside Diameter. | EXTRA STRONG. | | DOUBLE EXTRA. | | Inside Diameter. | EXTRA STRONG. | | DOUBLE EXTRA. | |
|------------------|---------------|-----------------|---------------|-----------------|------------------|---------------|-----------------|---------------|-----------------|
| | Thick-ness. | Price per Foot. | Thick-ness. | Price per Foot. | | Thick-ness. | Price per Foot. | Thick-ness. | Price per Foot. |
| Inches. | Inches. | Cts. | Inches. | \$ cts. | Inches. | Inches. | \$ cts. | Inches. | \$ cts. |
| $\frac{1}{8}$ | .10 | .13 | .. | .. | 2 | .22 | .72 | .44 | 1.44 |
| $\frac{1}{4}$ | .12 | .13 | .. | .. | $2\frac{1}{2}$ | .28 | 1.36 | .56 | 2.72 |
| $\frac{3}{8}$ | .13 | .15 | .. | .. | 3 | .30 | 1.71 | .60 | 3.42 |
| $\frac{1}{2}$ | .15 | .15 | .30 | .30 | $3\frac{1}{2}$ | .32 | 2.18 | .64 | 4.36 |
| $\frac{5}{8}$ | .16 | .20 | .32 | .40 | 4 | .34 | 2.75 | .68 | 5.50 |
| 1 | .18 | .33 | .36 | .66 | $4\frac{1}{2}$ | .. | 4.85 | .. | 9.70 |
| $1\frac{1}{4}$ | .19 | .38 | .39 | .70 | 5 | .. | 5.70 | .. | 11.40 |
| $1\frac{1}{2}$ | .20 | .57 | .40 | 1.14 | 6 | .. | 7.00 | .. | 14.00 |

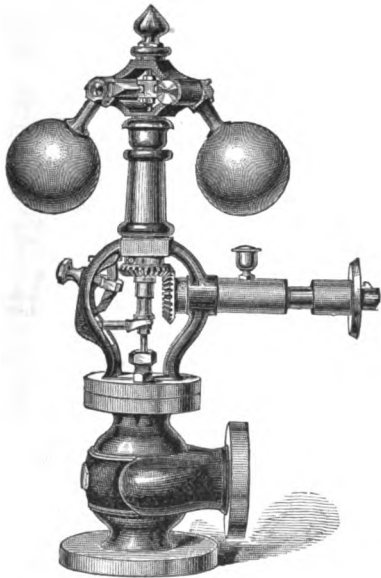
Lap Welded Boiler Tubes,

IN EIGHTEEN FEET LENGTHS; GREATER LENGTHS, EXTRA.

| Outside Diameter. | Weight per Foot. | Price per Foot. | Outside Diameter. | Weight per Foot. | Price per Foot. | Outside Diameter. | Weight per Foot. | Price per Foot. |
|-------------------|------------------|-----------------|-------------------|------------------|-----------------|-------------------|------------------|-----------------|
| Inches. | Pounds. | Cts. | Inches. | Pounds. | Cts. | Inches. | Pounds. | \$ cts. |
| 1 | .75 | .25 | $2\frac{3}{4}$ | 3.00 | .33 | 5 | 7.25 | .85 |
| $1\frac{1}{4}$ | .95 | .24 | 3 | 3.35 | .35 | 6 | 9.35 | 1.20 |
| $1\frac{1}{2}$ | 1.25 | .24 | $3\frac{1}{4}$ | 4.00 | .40 | 7 | 12.45 | 1.60 |
| $1\frac{3}{4}$ | 1.60 | .23 | $3\frac{3}{4}$ | 4.30 | .46 | 8 | 15.05 | 2.25 |
| 2 | 2.00 | .23 | $3\frac{1}{2}$ | 4.60 | .53 | 9 | 18.00 | .. |
| $2\frac{1}{4}$ | 2.20 | .25 | 4 | 5.40 | .58 | 10 | 22.20 | .. |
| $2\frac{3}{4}$ | 2.75 | .29 | $4\frac{1}{4}$ | 6.00 | .67 | .. | .. | .. |

The Shive Governor.

THE Shive Governor possesses, in an eminent degree, all the qualities desirable and requisite in an efficient governor.



It is the only governor in which the balls swing at an angle to the radial line, resulting in greater delicacy of operation than can be obtained by a radial movement. The slightest increase or decrease, in the amount of resistance to be overcome by the engine, is at

once indicated, by an alteration in the distance of the governor balls and a corresponding change in the steam-supply valve.

This mode of suspending the balls has the additional advantage of causing the governor to wear longer, by reason of there being much less friction than in the old method of construction. The balls swing in the direction most natural to freely suspended weights when the stem of the governor begins to revolve, while the least retardation causes the balls to gain in the direction of rotation, and return toward their center of revolution.

The automatic safety check stops the engine when anything occurs to interfere with the action of the governor, such as the breaking or falling off of the belt, or some accident to the gearing; at the same time it does not interfere in the slightest degree with the efficiency of the governor.

The feeder will instantly change the speed of the engine to any extent while running, and also automatically take up any lost motion that may occur, thus making the governor last longer.

The valve is perfectly balanced in all positions and is corrected simultaneously with any change of speed in the engine.

SIZES AND DIMENSIONS.

PRICE.

EXTRA.

| Diameter of Steam Pipe. | Diameter of Base Flange. | Diameter of Side Flange. | Base Flange to Centre of Steam Pipe. | Centre of Governor to Side Flange. | Centre of Governor to end of Shaft. | Base Flange to Centre of Shaft. | Extreme Height. | Greatest Spread of Balls. | Corresponding Diameter of Engine Cylinder. | Average Number of Revolutions. | Black. | Finished. | Ball and Lever. | Speeder. | Automatic Safety Check. | Stop Valve. |
|-------------------------|--------------------------|--------------------------|--------------------------------------|------------------------------------|-------------------------------------|---------------------------------|------------------|---------------------------|--|--------------------------------|--------|-----------|-----------------|----------|-------------------------|-------------|
| In. | In. | In. | In. | In. | In. | In. | In. | In. | Inches. | p. Min | \$ c. | \$ c. | \$ c. | \$ c. | \$ c. | \$ c. |
| 1 | 4 | ... | 13 $\frac{1}{2}$ | 2 | 8 $\frac{1}{2}$ | 6 | 13 $\frac{1}{2}$ | 10 | 2 to 4 | 150 | 16.00 | 18.00 | 1.90 | 2.25 | ... | 4.00 |
| 1 $\frac{1}{4}$ | 4 $\frac{1}{2}$ | ... | 21 $\frac{1}{2}$ | 2 $\frac{1}{2}$ | 9 $\frac{1}{2}$ | 7 $\frac{1}{2}$ | 16 $\frac{1}{2}$ | 11 | 4 " 5 | 100 | 18.00 | 20.00 | 2.00 | 2.85 | ... | 5.00 |
| 1 $\frac{1}{2}$ | 4 $\frac{3}{4}$ | 3 $\frac{1}{2}$ | 23 $\frac{1}{2}$ | 3 $\frac{1}{4}$ | 10 $\frac{1}{2}$ | 8 $\frac{1}{2}$ | 18 $\frac{1}{2}$ | 12 | 5 " 6 | 100 | 20.00 | 23.00 | 2.25 | 2.50 | ... | 6.00 |
| 2 | 6 | 4 $\frac{1}{2}$ | 31 $\frac{1}{2}$ | 4 | 11 $\frac{1}{2}$ | 10 $\frac{1}{2}$ | 22 | 14 | 6 " 8 | 100 | 23.00 | 27.00 | 2.50 | 2.75 | 8.00 | 7.50 |
| 2 $\frac{1}{2}$ | 7 | 5 $\frac{1}{2}$ | 37 $\frac{1}{2}$ | 4 $\frac{1}{2}$ | 12 $\frac{1}{2}$ | 12 | 24 $\frac{1}{2}$ | 15 | 8 " 10 | 90 | 27.00 | 31.00 | 2.75 | 2.75 | 9.00 | 9.00 |
| 3 | 7 $\frac{1}{2}$ | 6 $\frac{1}{2}$ | 44 $\frac{1}{2}$ | 5 $\frac{1}{2}$ | 13 $\frac{1}{2}$ | 12 $\frac{1}{2}$ | 26 $\frac{1}{2}$ | 17 $\frac{1}{2}$ | 10 " 12 | 90 | 36.00 | 41.00 | 3.50 | 3.50 | 10.00 | 12.00 |
| 3 $\frac{1}{2}$ | 9 | 7 $\frac{3}{4}$ | 51 $\frac{1}{2}$ | 6 $\frac{1}{2}$ | 15 | 15 $\frac{1}{2}$ | 30 $\frac{1}{2}$ | 19 $\frac{1}{2}$ | 12 " 14 | 80 | 45.00 | 52.00 | 4.25 | 4.25 | 11.00 | 17.00 |
| 4 | 9 $\frac{1}{2}$ | 7 $\frac{3}{4}$ | 54 $\frac{1}{2}$ | 6 $\frac{3}{4}$ | 15 | 16 | 32 | 20 | 14 " 16 | 80 | 54.00 | 62.00 | 4.50 | 4.50 | 12.50 | 21.00 |
| 4 $\frac{1}{2}$ | 10 | 8 $\frac{1}{2}$ | 57 $\frac{1}{2}$ | 7 $\frac{1}{2}$ | 17 | 18 | 36 | 23 | 16 " 18 | 76 | 61.08 | 73.00 | 5.00 | 5.00 | 14.50 | 25.00 |
| 5 | 10 $\frac{1}{2}$ | 9 $\frac{1}{2}$ | 60 $\frac{1}{2}$ | 8 | 17 | 20 | 38 | 25 $\frac{1}{2}$ | 18 " 20 | 76 | 74.00 | 84.00 | 5.50 | 5.50 | 16.00 | 31.00 |
| 5 $\frac{1}{2}$ | 12 | 10 | 72 $\frac{1}{2}$ | 8 $\frac{1}{2}$ | 21 $\frac{1}{2}$ | 21 $\frac{1}{2}$ | 42 $\frac{1}{2}$ | 25 | 20 " 21 | 70 | 84.00 | 95.00 | 6.00 | 6.50 | 17.50 | 37.00 |
| 6 | 13 $\frac{1}{2}$ | 11 | 73 $\frac{1}{2}$ | 10 $\frac{1}{2}$ | 25 | 23 $\frac{1}{2}$ | 47 | 27 | 24 " 28 | 65 | 112.00 | 125.00 | 7.00 | 7.50 | 19.00 | 50.00 |
| 7 | 15 | 13 | 86 $\frac{1}{2}$ | 11 $\frac{1}{2}$ | 30 | 25 $\frac{1}{2}$ | 50 | 29 | 28 " 32 | 60 | 132.00 | 146.00 | 8.00 | 9.50 | 22.00 | 60.00 |
| 8 | 16 | 15 | 94 $\frac{1}{2}$ | 12 $\frac{1}{2}$ | 33 | 30 | 55 | 31 | 32 " 36 | 55 | 160.00 | 176.00 | 9.00 | 10.00 | 25.00 | 75.00 |

The Judson Governor.

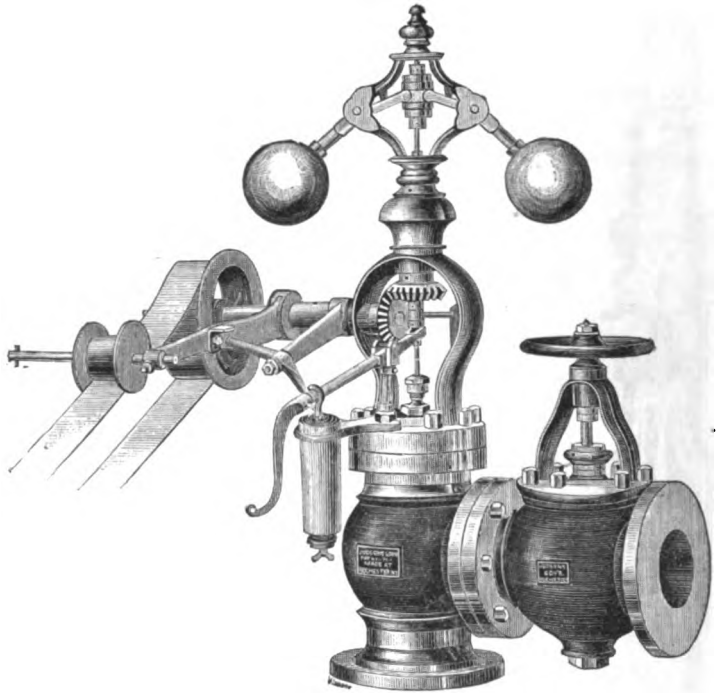
THE superiority of the Judson Governor is the result of much experimenting pursued through several years by the originators, and their liberal policy in securing the ownership of any real improvements on steam engine governors made within the last thirty years.

Its popularity is due in a great measure to the excellence of material, skillful workmanship, the use of patented novelties, and improved processes of manufacture used in the construction of this Governor.

This Governor is now offered at a price which makes it the lowest in the market, while it is inferior to none as an effective and reliable adjunct to the steam engine.

When the speeder attachment is used, the governor pulley should be about 5 per cent less in diameter than would run the engine the desired speed without speeder. By screwing up the speeder nut, condensing the spring, the motion of the engine will be increased to the desired speed, and the valve held steady by the increased spring tension. The speeder is not required on engines that are to run at one speed constantly, but should be used when fly-wheel is too light, causing the Governor to be jerked by the piston.

To find diameter of Governor-Shaft Pulley—Multiply number of revolutions of engine by



diameter of engine shaft pulley, and divide product by number of revolutions of governor.

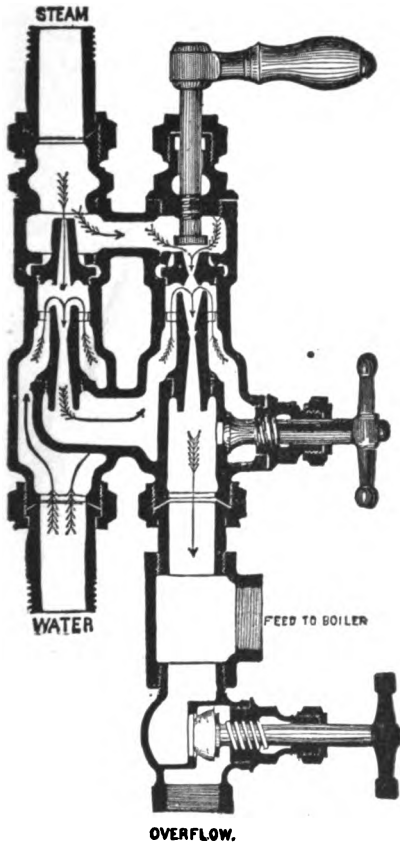
To find diameter of Engine-Shaft Pulley—Multiply number of revolutions of governor by diameter of governor-shaft pulley, and divide product by number of revolutions of engine.

When governors are ordered, be particular and say governor—with or without stop valve; plain or bright finish—with or without speed changer, stop motion or Sawyer's lever. Exact speed of each governor is marked on the top head.

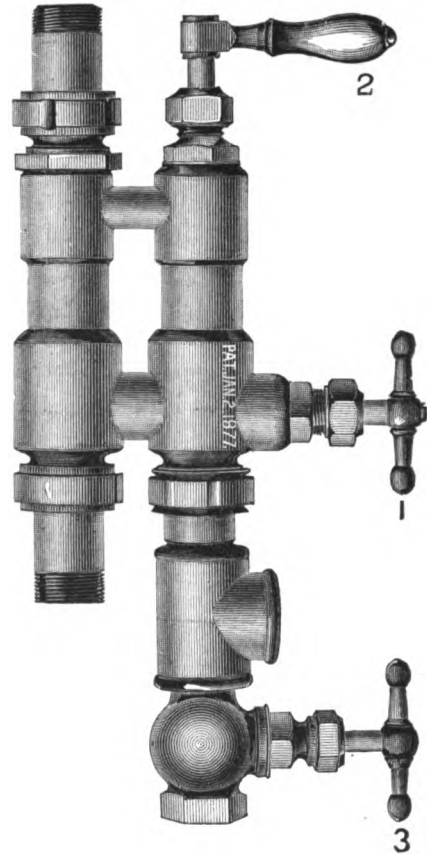
DIMENSIONS.

| Capacity of Governor, or Diameter of Steam Pipe. | Size of Governor to Diameter of Engine Cylinder at ordinary speed of engine. For greater speed, use larger Governors. | Diameter of Base Flange. | Diameter of Side Flange. | Distance from Base Flange to Center of Steam Pipe. | Distance from Center of Governor to end of Pulley Shaft. | Extreme Height. | Distance from Base Flange to Center of Pulley Shaft. | Speed of Governor, Number of Revolutions per minute. | Diameter and Face of Pulley that should be put on each Governor to drive it properly. | PRICE. | | | | |
|--|---|--------------------------|--------------------------|--|--|-----------------|--|--|---|---------|----------------|------------------------------------|---------------------------------|----------------------|
| | | | | | | | | | | Plain. | Bright Finish. | Spring Speeder for altering Speed. | Stop Motion and Spring Speeder. | Improved Stop Valve. |
| 1/2 | 2 to 3 | screwed | | 2 | 7 | 11 1/2 | 5 3/4 | 320 | 3 x 1 | \$15.00 | \$17.00 | \$1.60 | .. | .. |
| 3/4 | 3 " 3 | | | 3 | 7 1/2 | 12 3/4 | 6 5/8 | 320 | 3 x 1 1/4 | 16.00 | 18.00 | 1.70 | .. | .. |
| 1 | 4 " 5 | | | 3 3/8 | 10 1/4 | 13 3/4 | 7 5/8 | 160 | 3 1/2 x 1 1/4 | 18.00 | 20.00 | 1.80 | .. | .. |
| 1 1/4 | 5 " 6 | | | 4 | 10 1/2 | 14 1/2 | 8 3/4 | 140 | 4 x 1 1/4 | 20.00 | 23.00 | 1.90 | .. | .. |
| 1 1/2 | 6 " 7 | | | 4 1/8 | 11 1/4 | 15 1/2 | 9 1/4 | 135 | 4 x 1 1/2 | 23.00 | 27.00 | 2.00 | \$5.00 | 7.50 |
| 2 | 7 " 8 | | | 4 1/2 | 12 1/4 | 16 1/2 | 10 1/4 | 135 | 4 1/2 x 1 1/2 | 27.00 | 31.00 | 2.20 | 6.00 | 9.00 |
| 2 1/2 | 9 " 10 | | | 5 | 13 1/4 | 17 1/2 | 11 1/4 | 105 | 5 1/2 x 1 1/2 | 36.00 | 41.00 | 2.60 | 7.00 | 12.00 |
| 3 | 11 " 12 | | | 5 1/2 | 14 1/4 | 18 1/2 | 12 1/4 | 98 | 7 x 2 | 45.00 | 52.00 | 3.00 | 8.00 | 17.00 |
| 3 1/2 | 12 " 14 | | | 6 | 15 1/4 | 19 1/2 | 13 1/4 | 98 | 8 x 2 | 54.00 | 62.00 | 3.25 | 9.00 | 21.00 |
| 4 | 14 " 16 | | | 6 1/2 | 16 1/4 | 20 1/2 | 14 1/4 | 95 | 9 x 2 1/2 | 64.00 | 73.00 | 3.50 | 10.00 | 25.00 |
| 4 1/2 | 16 " 18 | | | 7 | 17 1/4 | 21 1/2 | 15 1/4 | 92 | 10 x 2 1/2 | 74.00 | 84.00 | 3.75 | 11.00 | 31.00 |
| 5 | 18 " 20 | | | 7 1/2 | 18 1/4 | 22 1/2 | 16 1/4 | 92 | 11 x 3 | 84.00 | 95.00 | 4.00 | 12.00 | 37.00 |
| 5 1/2 | 20 " 23 | | | 8 1/2 | 19 1/4 | 23 1/2 | 17 1/4 | 85 | 12 x 3 | 97.00 | 109.00 | 4.25 | 14.00 | 42.00 |
| 6 | 23 " 26 | | | 9 1/2 | 21 1/4 | 25 1/2 | 18 1/4 | 77 | 14 x 3 1/2 | 110.00 | 123.00 | 4.50 | 15.00 | 50.00 |

The Hancock Inspirator.



OVERFLOW.
SECTION.



ELEVATION.

THE Hancock Inspirator is the best appliance known for feeding all kinds of boilers, on account of its simplicity of operation, the range of its duties, and the fact that all steam used in operating it is returned to the boiler.

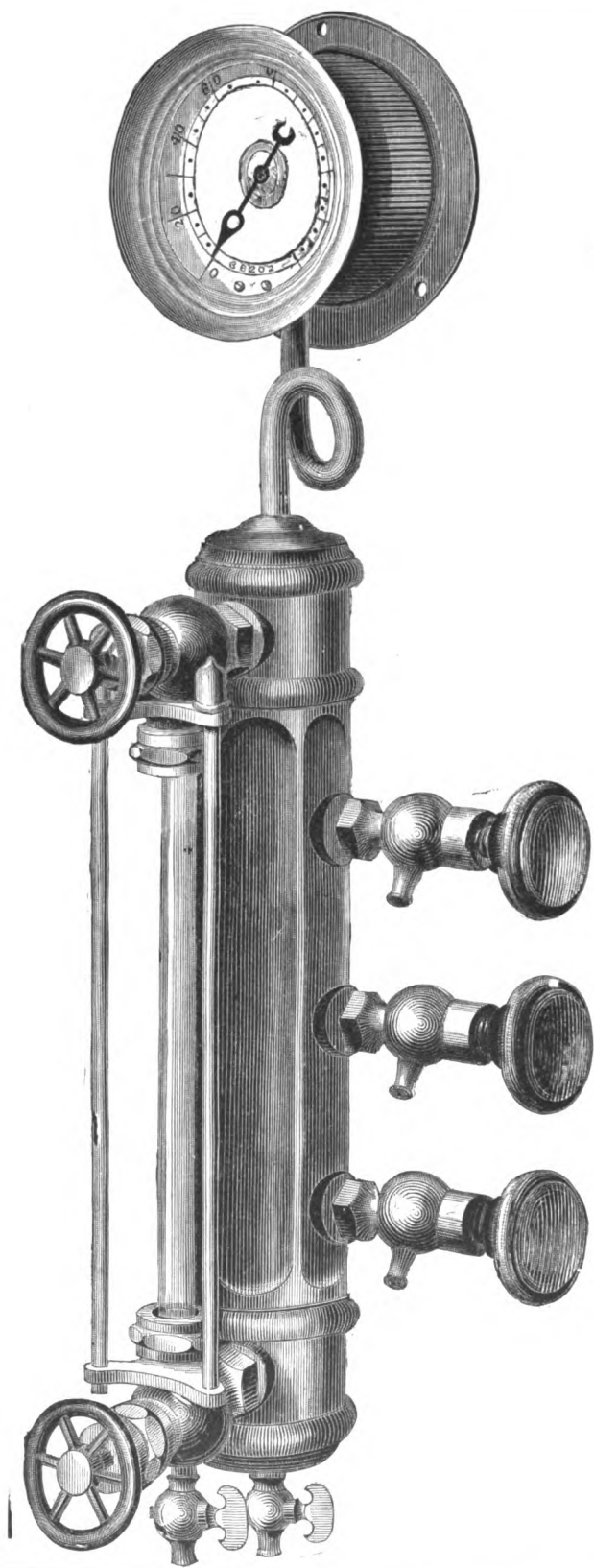
It differs materially in its construction from the class of boiler feeder known as injectors, inasmuch as it has one set of tubes for lifting and another for forcing water; a combination entirely new, reliable and efficient.

There being no moving parts in its internal construction it is not liable to get out of order;

it requires no oiling or adjusting to the varying steam pressures or lifts, and is always ready to start at a moment's notice.

Water can be delivered at a high or low temperature as may be desired, and all sizes will lift water twenty-five feet, working as well on that as on a low lift.

Each Inspirator is carefully tested before leaving the factory, and is guaranteed to perform all that is claimed for it, if attached and operated according to directions accompanying each machine.



Steam and Water Gauge Column.

We illustrate on opposite page a Steam and Water Gauge Column, with steam pressure gauge, glass water gauge and try cocks attached. One of the advantages of this arrangement is the ease with which it can be attached to a steam boiler, either directly or by means of pipes at any distance desired.

The steam gauges can be furnished separately with dials from four to ten inches in

diameter, and to indicate from one to two-hundred pounds pressure to the square inch.

Glass water gauges of any length required, with two or four protecting rods.

Try cocks of various styles—different designs from those illustrated, will be found in another part of this catalogue.

Steam and water gauge column, complete:
No. 1.....\$15.00 | No. 2.....\$20.00

UTICA STEAM GAUGE.

| | | | |
|-----------------------------------|---------|---|---------|
| 3½ inch dial, iron case..... | \$ 4.50 | 6½ inch dial, comp'n case, low pressure.. | \$16.00 |
| 5 " " " " | 6.00 | 6½ " " " " high pressure. | 16.00 |
| 6 " " " " | 7.50 | 6½ " " " " vacuum..... | 16.00 |
| 6½ " " " " | 9.00 | 8 " " " " pressure..... | 23.50 |
| 6½ " " " " vacuum..... | 9.00 | 8 " " " " vacuum | 23.50 |
| 3½ " " comp'n case, pressure..... | 7.00 | 8½ " " " " pressure..... | 26.75 |
| 5 " " " " " | 10.75 | 8½ " " " " vacuum..... | 26.75 |
| 6 " " " " low pressure.. | 13.00 | 10 " " " " pressure..... | 35.00 |
| 6 " " " " high pressure. | 14.00 | 10 " " " " vacuum..... | 35.00 |

GLASS WATER GAUGES.

| No. | | | | | | | | | | Price. |
|-----|-------------------|---------|-------------|------------------|-----------------|-----------|---|---|--------|--------|
| 0. | Screw connection, | ¾ inch, | Glass Tube, | ½ inch diameter, | 10 inches long, | Two Rods, | | | | \$3.00 |
| 1. | " | " | 1½ " | " | " | 11 " | " | " | " | 4.00 |
| 2. | " | " | ¾ " | " | " | 14 " | " | " | " | 5.00 |
| 3. | " | " | 1½ " | " | " | 11 " | " | " | Four " | 4.75 |
| 4. | " | " | ¾ " | " | " | 14 " | " | " | " | 6.00 |
| 5. | " | " | 1½ " | " | " | 11 " | " | " | " | 5.00 |
| 6. | " | " | ¾ " | " | " | 14 " | " | " | " | 7.50 |
| 7. | " | " | 1½ " | " | " | 11 " | " | " | Two " | 8.00 |
| 8. | " | " | ¾ " | " | " | 14 " | " | " | " | 10.00 |
| 9. | " | " | ¾ " | " | " | 18 " | " | " | " | 14.00 |
| 10. | " | " | ¾ " | " | " | 14 " | " | " | Four " | 10.00 |
| 11. | " | " | ¾ " | " | " | 18 " | " | " | " | 14.00 |
| 12. | Flanges, | | | | | 18 " | " | " | " | 22.00 |
| 13. | Screw connection, | ¾ " | " | " | " | 14 " | " | " | Two " | 14.00 |

Nos. 0, 1, 2, 3 and 4 have Iron Wheel Handles.

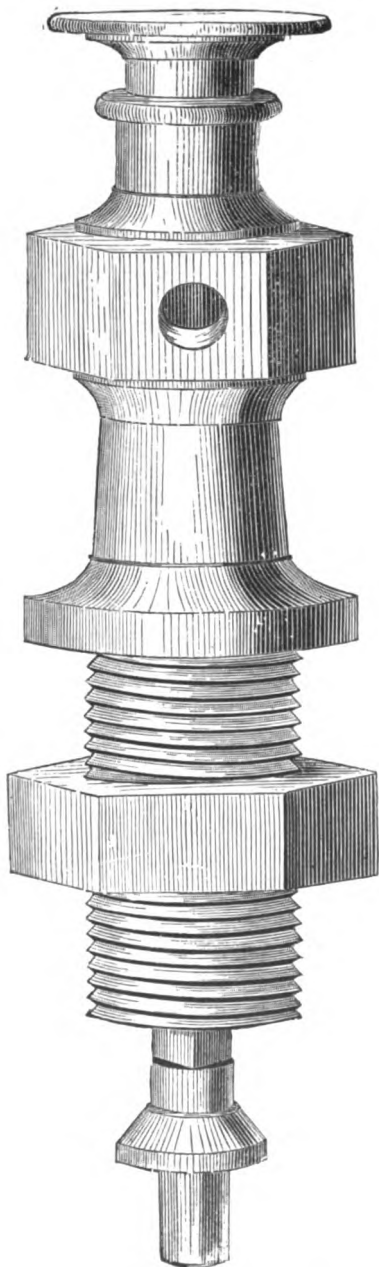
" 5 and 6 have Round Wooden Handles.

" 7, 8 and 9 have Round Metal Handles.

" 10, 11 and 12 have Iron Wheel Handles.

" 13 has Brass Bibb or Straight Handles.

Steam and Water Gauge or Try Cocks.



Mississippi Gauge Cock.

All sizes above $8\frac{1}{2}$ inches are furnished with gauge cocks.

ASHCROFT STEAM GAUGE.

Pressure or Vacuum.

| | |
|--|---------|
| $8\frac{1}{2}$ inch dial, iron case..... | \$ 6.00 |
| $4\frac{1}{2}$ " " " " | 6.00 |
| $5\frac{1}{2}$ " " " " | 8.00 |
| 6 " " " " | 12.00 |
| $6\frac{1}{2}$ " " " " | 16.00 |
| $8\frac{1}{2}$ " " " " | 30.00 |
| 10 " " " " | 30.00 |
| 2 " " brass case..... | 8.00 |
| $3\frac{1}{2}$ " " " " | 8.00 |
| $4\frac{1}{2}$ " " " " | 8.00 |
| $5\frac{1}{2}$ " " " " | 12.00 |
| 6 " " " " | 16.00 |
| $6\frac{1}{2}$ " " " " | 20.00 |
| 10 " " " " | 40.00 |
| 12 " " " " | 70.00 |

GAUGE OR TRY COCKS.

Price, per Dozen.

Crank Handle Try Cocks:

| | |
|---|---------|
| No. 1, Screw connection $\frac{1}{2}$ | \$13.00 |
| " 2, " " $\frac{1}{4}$ | 18.00 |
| " 3, " " $\frac{3}{4}$ | 21.00 |

Round Wooden Handle Try Cocks:

| | |
|---|-------|
| No. 4, Screw connection $\frac{1}{2}$ | 15.00 |
| " 5, " " $\frac{1}{4}$ | 21.00 |
| " 6, " " $\frac{3}{4}$ | 24.00 |

Crank Handle Try Cocks:

| | |
|--------------------------------------|-------|
| No. 7, Screw and nut connection..... | 42.00 |
|--------------------------------------|-------|

Wooden Handle, Babbitt Metal Seat:

| | |
|---|-------|
| No. 8, Screw connection $\frac{1}{2}$ | 27.00 |
| " 9, " " $\frac{3}{4}$ | 30.00 |
| " 10, " " $\frac{1}{4}$ | 24.00 |
| " 11, " " $\frac{3}{4}$ | 27.00 |

Wooden Handle Try Cocks:

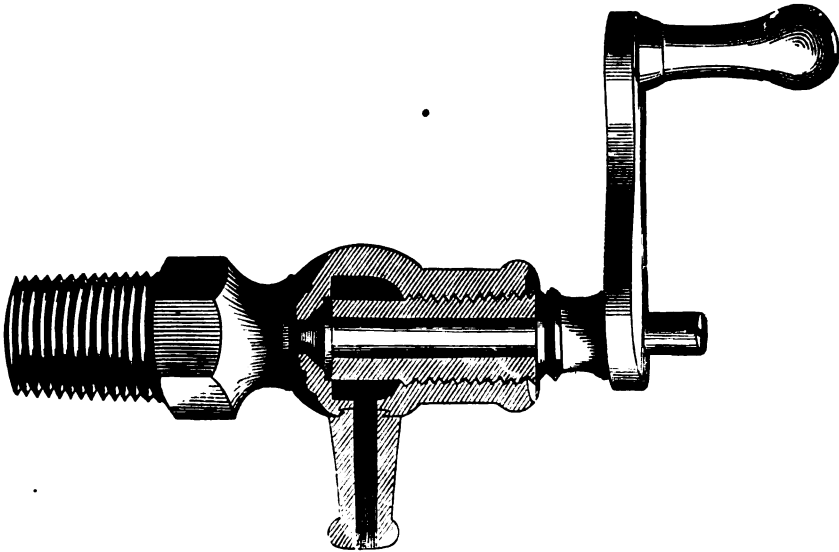
| | |
|--|-------|
| No. 12, Screw connection $\frac{1}{2}$ | 10.50 |
| " 13, " " $\frac{1}{4}$ | 12.00 |
| " 14, " " $\frac{3}{4}$ | 15.00 |

| | |
|-------------------------------|-------|
| Babbitt Seat, for No. 12..... | 11.50 |
| " " " " 13..... | 13.00 |
| " " " " 14..... | 16.50 |

Crank Handle Try Cocks:

| | |
|--|-------|
| No. 15, Screw connection $\frac{1}{2}$ | 10.00 |
| " 16, " " $\frac{1}{4}$ | 12.00 |
| " 17, " " $\frac{3}{4}$ | 14.00 |

Steam Boiler Try Cocks.



We illustrate on this and the opposite page a few different styles of Steam Boiler Gauges or Try Cocks.

The first is known as the Mississippi Pattern and can be furnished of the following sizes:

| | |
|---|---------|
| No. 34, 2 inch shank, steam metal.... | \$40.00 |
| " 35, 1½ " " " " | 36.00 |
| " 36, 2x1½ " " " " | 33.00 |
| " 37, 1½x½ " " " " | 24.00 |
| " 38, 2½ in. taper shank, 1½ in. diameter, steam metal | 18.00 |
| No. 39, 2½ in. taper shank, 1 in. diameter, steam metal | 14.00 |
| No. 40, 2½ in. taper shank, ¾ in. diameter, steam metal | 10.50 |
| No. 41, 2 in. taper shank, ½ in. diameter, steam metal..... | \$ 9.50 |
| No. 42, 1½ in. taper shank, ⅜ in. diameter, steam metal..... | 8.50 |

Prices per dozen.

The next is a Patent Gauge Cock with a wooden handle, which merely needs to be pressed down to try water level; the advantage of the wooden handle is in its not getting so hot as metal and the construction easier to operate.

The Crank Handle Try Cock (interior of which is shown in cut) has the advantage of long continued use.



GAUGE OR TRY COCKS.

Wooden Handle and Packing Nut:

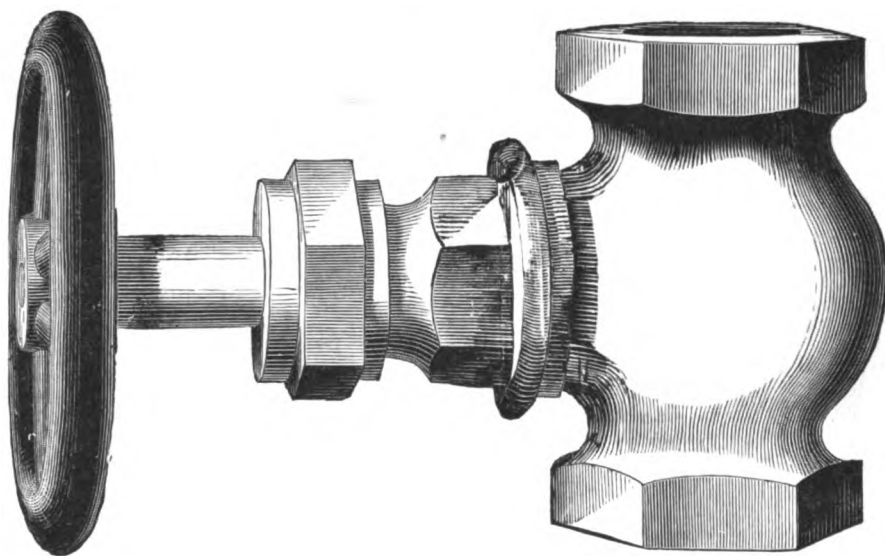
| | |
|---|---------|
| No. 18, Screw connection ½ inch, per doz. | \$15.00 |
| " 19, " " ¾ " " " | 18.00 |
| " 20, (Locomotive) blank " " | 36.00 |

REGESTER'S PAT. TRY COCK.

Screwed for ½, ¾ and 1 inch pipe or blank:

| | |
|-----------------|-------------|
| Iron Ball,..... | each \$1.00 |
| Brass " | " 1.75 |

Globe Valve.



DIRECT OR ANGLE VALVES OF STEAM METAL.

| Size. | Price, each. | With Double Seats. | Price, each. | Size. | Price, each. | With Double Seats. | Price each. |
|-----------------------|--------------|--------------------|--------------|------------------------|--------------|--------------------|-------------|
| $\frac{1}{8}$ inch... | \$ 0.60 | Extra Heavy,..... | — | $1\frac{1}{2}$ inch... | \$ 3.60 | Extra Heavy,..... | \$ 5.25 |
| $\frac{1}{4}$ "... | 0.60 | " "..... | — | 2 "... | 5.60 | " "..... | 7.75 |
| $\frac{3}{8}$ "... | 0.75 | " "..... | — | $2\frac{1}{2}$ "... | 11.25 | " "..... | 14.00 |
| $\frac{1}{2}$ "... | 0.95 | " "..... | \$ 1.25 | 3 "... | 16.00 | " "..... | 19.00 |
| $\frac{3}{4}$ "... | 1.30 | " "..... | 1.80 | $3\frac{1}{2}$ "... | 28.00 | | |
| 1 "... | 1.70 | " "..... | 2.50 | 4 "... | 40.00 | | |
| $1\frac{1}{4}$ "... | 2.60 | " "..... | 3.75 | | | | |

Cross or Tee Valve.

STEAM METAL.

| Size. | Price, each. | Size. | Price, each. |
|-------------------------------|--------------|--------------------------------|--------------|
| $\frac{1}{2}$ inch Pipe | \$ 1.50 | $1\frac{1}{2}$ inch Pipe | \$ 5.00 |
| $\frac{3}{4}$ " " | 2.00 | 2 " " | 8.00 |
| 1 " " | 2.50 | $2\frac{1}{2}$ " " | 16.00 |
| $1\frac{1}{4}$ " " | 3.50 | 3 " " | 24.00 |

Double Flange Valve.

DIRECT OR ANGLE.

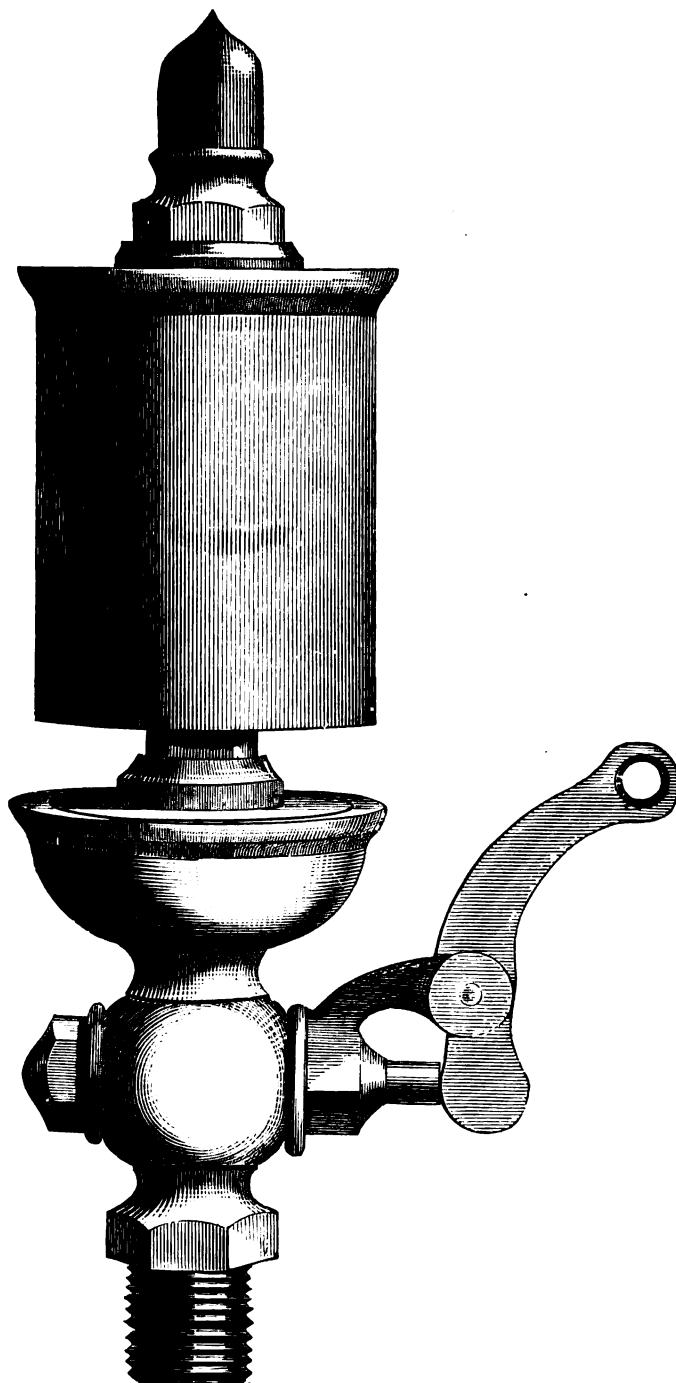
| Size. | Diameter of Flange. | Price, each. | Size. | Diameter of Flange. | Price, each. |
|-----------------------|---------------------|--------------|-----------------------|---------------------|--------------|
| 1 inch..... | 4 inch | \$ 5.00 | 3 inch..... | 8 inch | \$ 30.00 |
| $1\frac{1}{4}$ "..... | 5 " " | 7.00 | $3\frac{1}{2}$ "..... | 9 " " | 45.00 |
| $1\frac{1}{2}$ "..... | $5\frac{1}{2}$ " " | 9.00 | 4 "..... | 10 " " | 65.00 |
| 2 "..... | $6\frac{1}{2}$ " " | 14.00 | 5 "..... | 11 " " | 120.00 |
| $2\frac{1}{2}$ "..... | 7 " " | 20.00 | 6 "..... | 12 " " | 180.00 |

Safety Valve.

COMPLETE, WITH LEVER AND BALL.

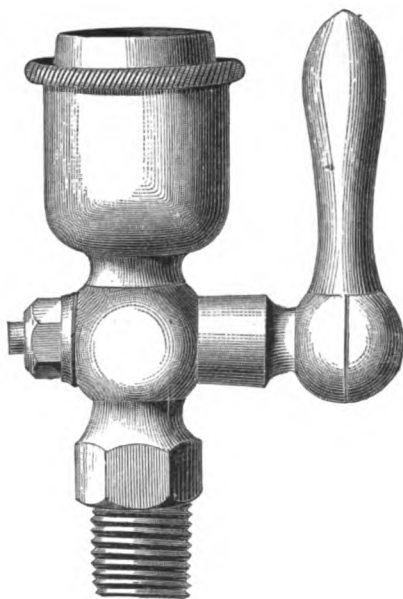
| Size. | Price, each. | Price, each. | Size. | Price, each. | Price, each. |
|-------------------------------|--------------|----------------------|--------------------------------|--------------|----------------------|
| $\frac{1}{2}$ inch, Brass, .. | \$2.25 | Steam Metal, .. \$ — | $1\frac{1}{2}$ inch, Brass, .. | \$7.00 | Steam Metal, .. \$ — |
| $\frac{3}{4}$ " " " .. | 2.80 | " " " .. — | 2 " " " .. | 11.00 | " " " .. — |
| 1 " " " .. | 3.80 | " " " .. — | $2\frac{1}{2}$ " " " .. | — | " " " .. — |
| $1\frac{1}{4}$ " " " .. | 5.50 | " " " .. — | | | |

Steam Whistles.



| | | | | | | | | | | |
|-------------------|------|------|------|------|------|-------|-------|-------|-------|---------|
| Size..... | 1½ | 2 | 2½ | 3 | 3½ | 4 | 5 | 6 | 8 | Number. |
| Price, each | 4.00 | 4.25 | 5.50 | 7.00 | 9.50 | 12.00 | 19.00 | 25.00 | 65.00 | \$ cts. |

Screw Cap Oil Cups.



LEVER HANDLE.

| | | | | | | | | |
|------------------|-----|-----|------|------|------|------|------|---------|
| Size..... | 13½ | 14 | 15 | 16 | 17 | 17½ | 18 | Number. |
| Connection..... | ¼ | ¼ | ⅝ | ¾ | ¾ | ¾ | ¾ | Inches. |
| Price, each..... | .80 | .95 | 1.25 | 1.50 | 2.00 | 2.50 | 3.25 | \$ cts. |

TEE HANDLE.

| | | | | | | | | |
|------------------|-----|-----|------|------|------|------|------|---------|
| Size..... | 8 | 9 | 10 | 11 | 12 | 12½ | 18 | Number. |
| Connection..... | ¼ | ¼ | ⅝ | ¾ | ¾ | ¾ | ¾ | Inches. |
| Price, each..... | .75 | .90 | 1.15 | 1.45 | 1.75 | 2.25 | 3.00 | \$ cts. |



Patent Glass Oil Cups.

| | | | | | | | |
|-----------------------|------|------|------|------|------|------|---------|
| Size..... | 0 | 1 | 2 | 3 | 4 | 5 | Number. |
| Screw Connection,.... | ¼ | ¾ | ¾ | ¾ | ¾ | ¾ | Inches. |
| Price, each..... | 1.15 | 1.30 | 1.60 | 2.50 | 4.00 | 5.25 | \$ cts. |
| Extra Glass..... | .20 | .20 | .30 | .40 | .50 | .75 | cts. |

Globe Oil Cups.

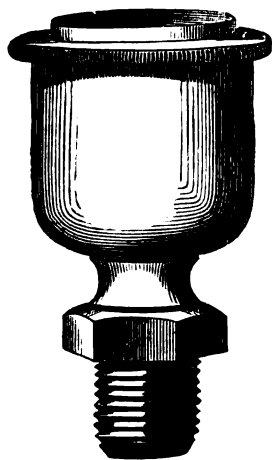
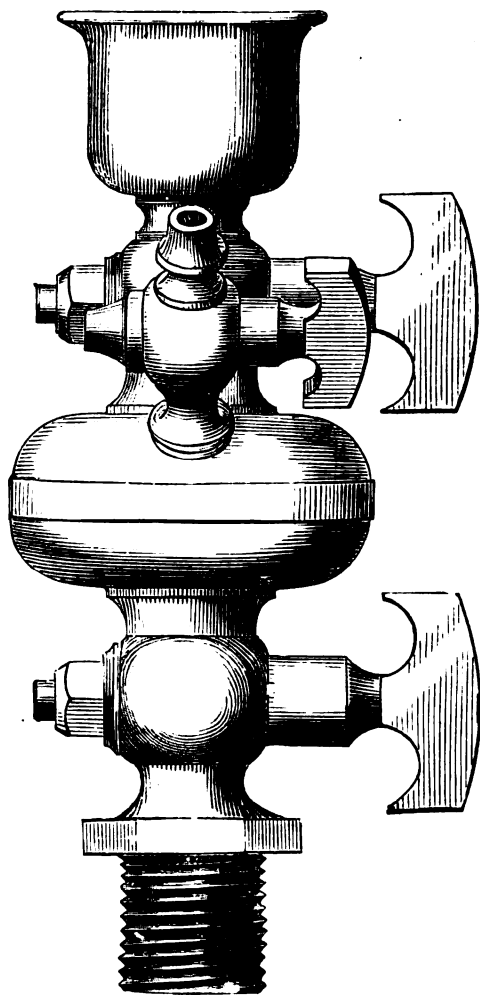
| | | | | | | | | | | | | |
|-----------------------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|
| Size..... | 0 | 1 | 2 | 3 | 3½ | 4 | 4½ | 5 | 5½ | 6 | 6½ | No. |
| Screw Connection,.... | ¼ | ¼ | ¼ | ¾ | ¾ | ¾ | ¾ | ¾ | ¾ | 1 | 1 | In. |
| Price, each..... | 3.75 | 4.50 | 5.25 | 6.00 | 6.50 | 7.50 | 9.00 | 12.00 | 13.00 | 16.00 | 17.00 | \$ c. |

Nos. 0, 1, 2, 3 and 4, with Tee Handles.

Nos. 5 and 6 have Crank Handle Cocks.

Nos. 8½, 4½, 5½ and 6½ have Valves with Wheel Handles.

Open Tallow Cups.



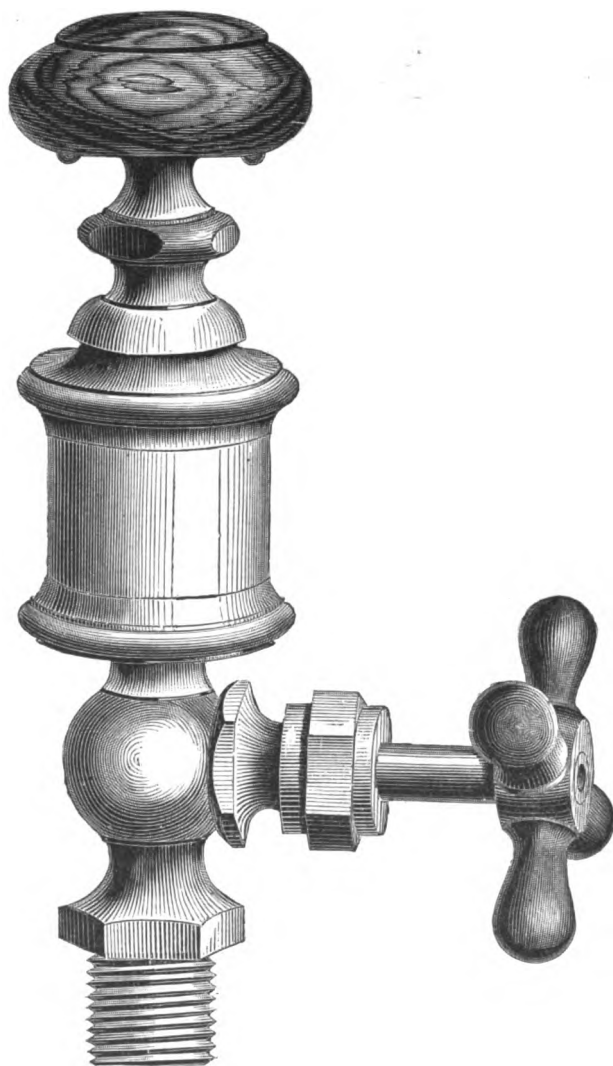
For $\frac{3}{4}$ inch pipe connection.....each, \$ 7.50
 " 1 " " " " 10.00

Plain Oil Cups,

WITH SCREW TOPS.

| | | | | | | | | | | | | |
|--------------|------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------|
| Size | 31 $\frac{1}{2}$ | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | No. |
| Connection, | $\frac{1}{8}$ | $\frac{1}{4}$ | $\frac{1}{4}$ | $\frac{1}{4}$ | $\frac{3}{8}$ | $\frac{5}{8}$ | $\frac{1}{2}$ | $\frac{3}{4}$ | $\frac{3}{4}$ | $\frac{3}{4}$ | $\frac{3}{4}$ | Inches. |
| Price, each, | .28 | .33 | .38 | .41 | .58 | .70 | 1.00 | 1.25 | 2.00 | 2.50 | 3.50 | \$ cts. |

Valve Lubricator Cups.



| | | | | | | | | | | | | | |
|------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------|
| Size..... | 7 | 8 | 9 | 10 | 11 | 12 | 15 | 16 | 17 | 18 | 19 | 20 | No. |
| Connection..... | $\frac{3}{8}$ | $\frac{3}{8}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{3}{8}$ | $\frac{3}{8}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | Inches. |
| Price, each..... | 1.75 | 1.85 | 2.15 | 2.63 | 3.00 | 3.50 | 1.50 | 1.60 | 1.90 | 2.35 | 2.90 | 3.20 | \$ cts. |

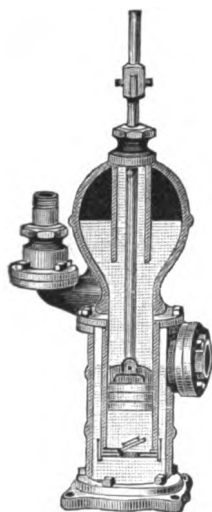
Nos. 7, 8, 9, 10, 11 and 12 have Round Wooden Valve Handles.

Nos. 15, 16, 17, 18, 19 and 20 have Cross Handles, as illustrated.

Steam Valves.

| | | | | | | | | | | | | |
|---------------------------|---------------|-----------------|---------------|-----------------|------|-----------------|-----------------|-----------------|-------|-----------------|-----------------|---------|
| Size of Connection..... | $\frac{1}{4}$ | $\frac{3}{8}$ | $\frac{1}{2}$ | $\frac{3}{4}$ | 1 | 1 $\frac{1}{4}$ | 1 $\frac{1}{2}$ | 1 $\frac{3}{4}$ | 2 | 2 $\frac{1}{2}$ | 2 $\frac{3}{4}$ | Inches. |
| Diameter of Bell..... | 1 | 1 $\frac{1}{2}$ | 2 | 2 $\frac{1}{2}$ | 3 | 4 | 4 | 5 | 6 | 8 | 10 | Inches. |
| Price, without Valve..... | 1.70 | 2.50 | 3.00 | 4.00 | 5.50 | 7.75 | 10.00 | 16.00 | 22.00 | 50.00 | 80.00 | \$ cts. |
| " with Valve..... | 3.50 | 4.00 | 4.25 | 5.50 | 7.00 | 9.50 | 12.00 | 19.00 | 25.00 | 65.00 | ..... | \$ cts. |

The Tom Thumb Force Pumps.



For deep wells and high lifts, where an air chamber is needed, both on the suction and pressure pipes of the pump, we recommend the "Tom Thumb" Force Pump. It should be placed at a convenient depth in the well and connected by iron or wooden pitman rod with the power employed. It is particularly fit to work by an automatic wind-mill, or surplus steam or water power.

The suction orifice, being situated at or near the top of the working cylinder, causes the valves to be always submerged in from five to ten inches of water, keeping the pump primed at all times. The inside cylinder, valve seats, etc., are all brass; the piston rod is cased in brass and works through a brass stuffing gland, making the working parts of the pump



non-corrosive. Our sectional and outside views of the pump will fully illustrate the rest of the details.

Knuckle joint for welding to iron rod or strap for attaching to wood as ordered. All parts of pump made on the interchangeable plan, so that broken or worn out portions can be replaced without trouble.

| Number of Pump. | Diameter of Cylinder. | Capacity each Stroke. | Length of Stroke. | Size of Pipe. | Price of Pump. |
|-----------------|-----------------------|-----------------------|-------------------|---------------|----------------|
| No. | Inches. | Gallons. | Inches. | Inches. | \$ c. |
| 1 | 3 | 1 | 7 | 1½ | 25.25 |
| 2 | 3½ | 1½ | 7 | 1½ | 27.25 |
| 3 | 4 | 2 | 7 | 2 | 30.50 |
| 4 | 5 | 3 | 10 | 2½ | 44.00 |
| 5 | 6 | 4 | 10 | 3 | 50.00 |

The Aquaject.

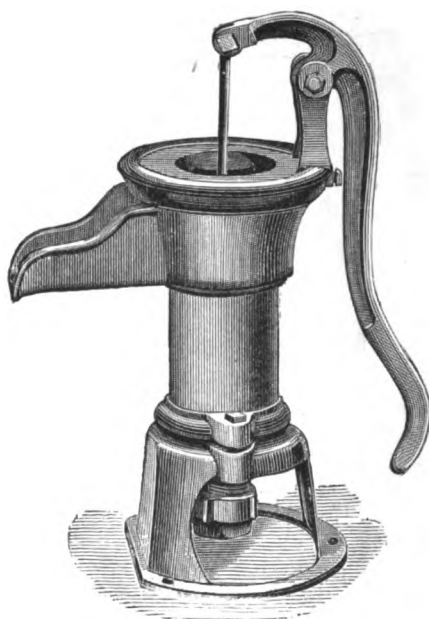
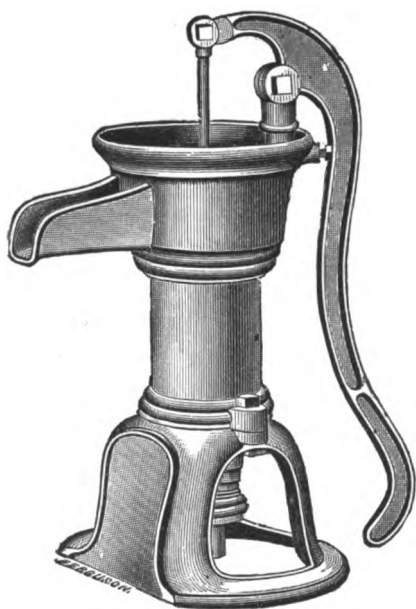
THE annexed cut shows the practical operation of our Portable Aquaject, the most effective hand apparatus ever invented for throwing water. All working parts liable to corrosion are made of brass. For windows, carriages, gardens or conservatories, it has no equal. In a diminished degree it is capable of every use of an ordinary force pump, and far more convenient. It is always ready for use and not liable to get out of order. Will throw water at the rate of 8 to 10 gallons per minute, to a height of 50 feet.

Each Pump has suction and discharge hose, connected, so that it requires no labor to put in immediate operation. Longer lengths of hose can be furnished if desired.

With 3 feet suction and 3 feet discharge hose, brass discharge nozzle and rose sprinkler\$9.00



Pitcher Spout Cistern Pumps.



WE here illustrate our new style of Pitcher Spout Cistern Pumps with open or close top, which we can also supply with close spout at the same price. It is neatly and tastefully designed, and convenient in all its applications.

In the close top the water is confined to the spout, and cannot splash over when pumping rapidly, and dust or other foreign substances are less likely to get in the pump.

The open top pumps have an adequate reservoir to hold surplusage of water, which is readily discharged by the pitcher spout.

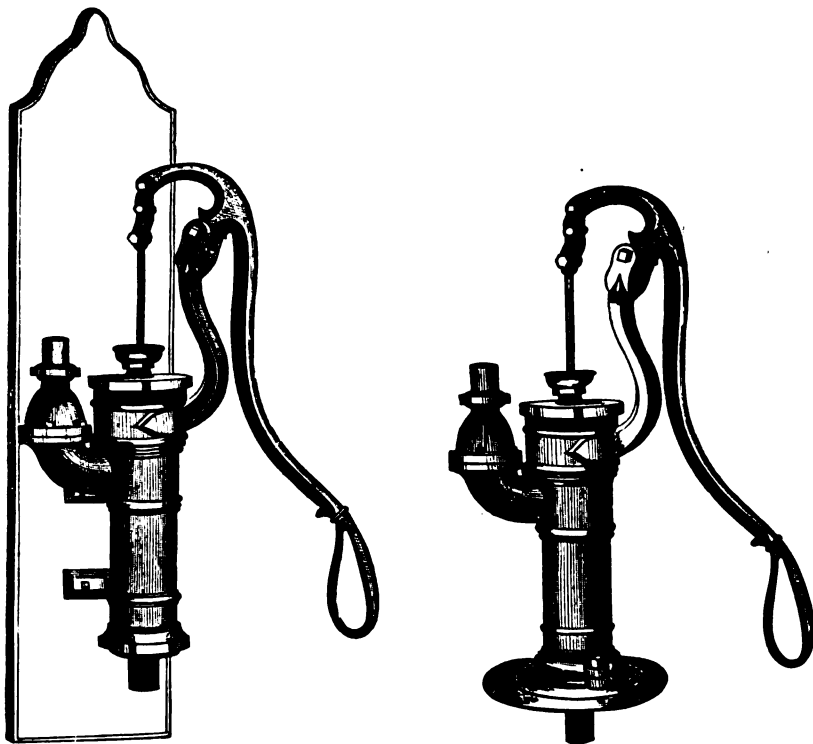
These pumps are anti-freezing by simply raising the hand lever to its full height and

tripping the valves, which allows the water to run back and leave the pipe empty.

They can be furnished with open or closed tops and fitted for lead or iron pipe. Each and every part can be instantly duplicated, being made on the interchangeable system.

| Diameter of Cylinder. | Capacity of Stroke. | Size of Water Pipe. | Complete Pump. |
|-----------------------|---------------------|---------------------|----------------|
| 2½ | ⅞ | 1 | \$4.25 |
| 3 | ¾ | 1½ | 4.75 |
| 3½ | ¾ | 1½ | 5.25 |
| 4 | ¾ | 1½ | 5.75 |
| 4½ | ¾ | 2 | 6.25 |

Bracket and Stand Pumps.



THE annexed engravings are a correct representation of our new style of Force Pumps, which can be furnished mounted on a base, or with brackets to fasten to wall or post.

Instead of a direct upward connection, an air chamber is added with or without side outlet and brass faucet or fire hose.

These Pumps have a revolving fulcrum so that the hand lever may be turned to either side of the pump, brass piston rod, brass stuffing box and brass valve seat with union coupling.

There are three sizes of these Pumps entirely of iron with the exception of the parts mentioned; also with brass cylinder and

plunger; likewise all brass excepting the hand lever, fulcrum and base.

When these Pumps are required for hot water or spirits they are made with brass instead of leather or rubber valves, and parties ordering should state use pump is to be put to.

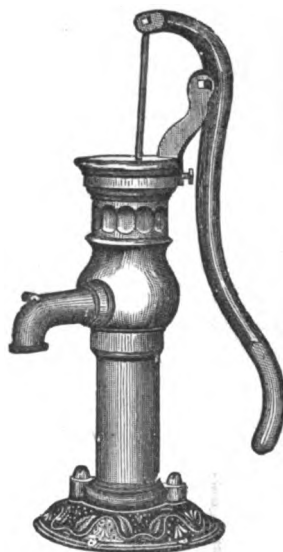
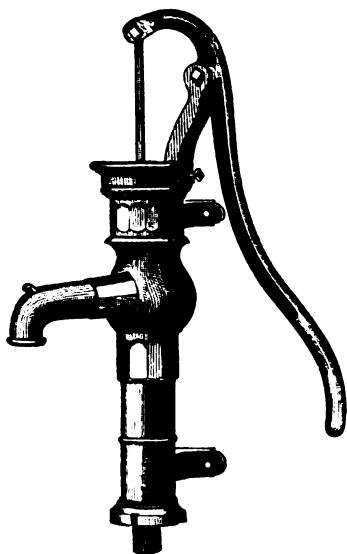
These Pumps are anti-freezing; lifting the hand lever to its full height trips the valves and allows the water to run back.

The four-inch Pump has a rubber buffer on the fulcrum.

Side outlet on air chamber.....\$1.00
Brass faucet..... 1.50
Discharge pipe and three feet of hose.... 3.00

| DIMENSIONS. | | | PUMP WITH BASE. | | | | PUMP WITH BRACKETS. | | | |
|-----------------------|----------------------|---------------|-----------------|----------------------|------------------------|-----------------------------|--------------------------|----------------------|------------------------|-----------------------------|
| Diameter of Cylinder. | Capacity per Stroke. | Size of Pipe. | Iron Pump. | Brass Cylinder Pump. | Iron Pump Air Chamber. | Brass Cylinder Air Chamber. | Iron Pump Wall Brackets. | Brass Cylinder Pump. | Iron Pump Air Chamber. | Brass Cylinder Air Chamber. |
| Inches. | Gallons. | Inches. | Price. | Price. | Price. | Price. | Price. | Price. | Price. | Price. |
| 2½ | 1½ | 1½ | \$9.50 | \$14.00 | \$10.00 | \$15.00 | \$9.50 | \$14.00 | \$10.00 | \$15.00 |
| 3 | 2 | 1½ | 11.00 | 15.00 | 12.00 | 16.00 | 11.00 | 15.00 | 12.00 | 16.00 |
| 4 | 3 | 2 | 18.00 | 28.00 | 21.00 | 30.00 | 18.00 | 30.00 | 21.00 | 31.00 |

Hand Lever Cistern Pumps.



THESE two cuts illustrate our Hand Lever Cistern Pump, constructed either for mounting against the wall or for use as a stand pump on flanged base.

All parts of these pumps are made of brass except the lever, bearer and base; the cylinders are bored and highly polished. We also illustrate a slightly different style of pump, which can be furnished at a much lower price by reason of its being constructed of iron. Par-

ties ordering will please state whether they are to be required to pump hot or cold liquids, oil or water.

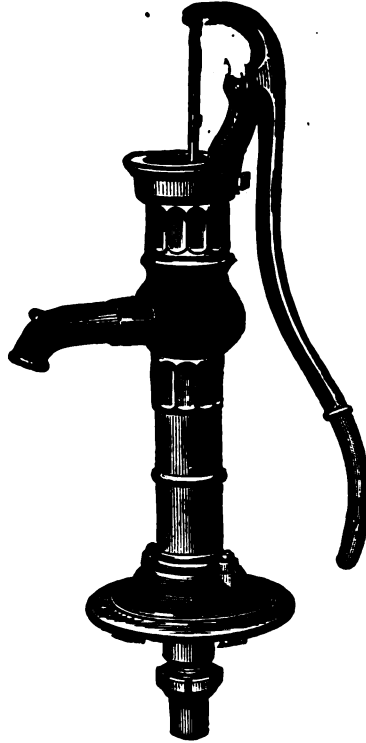
There is an adequate reservoir above the spout which prevents the surplus water from splashing over when pump is worked rapidly.

The top is revolving, and it can consequently be used as a right or left hand pump by simply loosening the set screw.

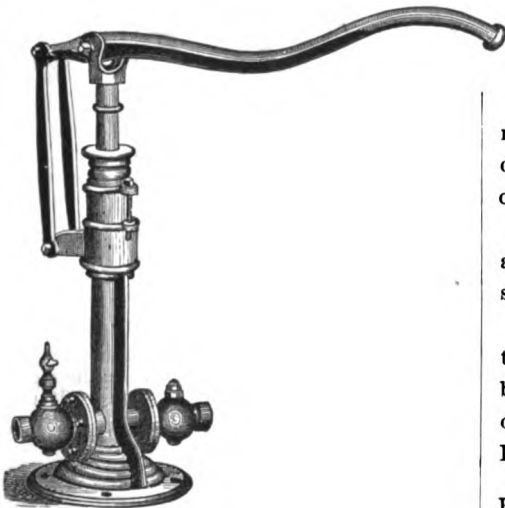
SIZES, CAPACITY AND PRICE.

| | | | | | | | | |
|--------------------------------|--------|--------|--------|---------|---------|---------|---------|---------|
| Diameter of Cylinder..... | 2 | 2½ | 3 | 3½ | 4 | 4½ | 5 | 6 |
| Capacity in Gallons..... | 1-15 | 1-12 | 1-11 | 1-10 | 1-8 | 1-6 | 1-4 | 1-3 |
| Size of Pipe..... | 1 | 1 | 1½ | 1½ | 1½ | 1½ | 2 | 2½ |
| PRICES: | | | | | | | | |
| All parts Brass..... | \$7.75 | \$8.75 | \$9.25 | \$10.50 | \$17.00 | \$21.00 | \$27.00 | \$32.00 |
| Iron, with Brass Cylinder..... | 5.50 | 6.00 | 7.00 | 8.00 | 10.00 | 14.00 | 18.00 | \$12.00 |
| All parts Iron..... | 3.50 | 4.00 | 4.50 | 5.00 | 5.50 | 6.50 | 8.00 | 20.00 |

Hand Lever Cistern Pump.



Hydraulic Pressure Pump.



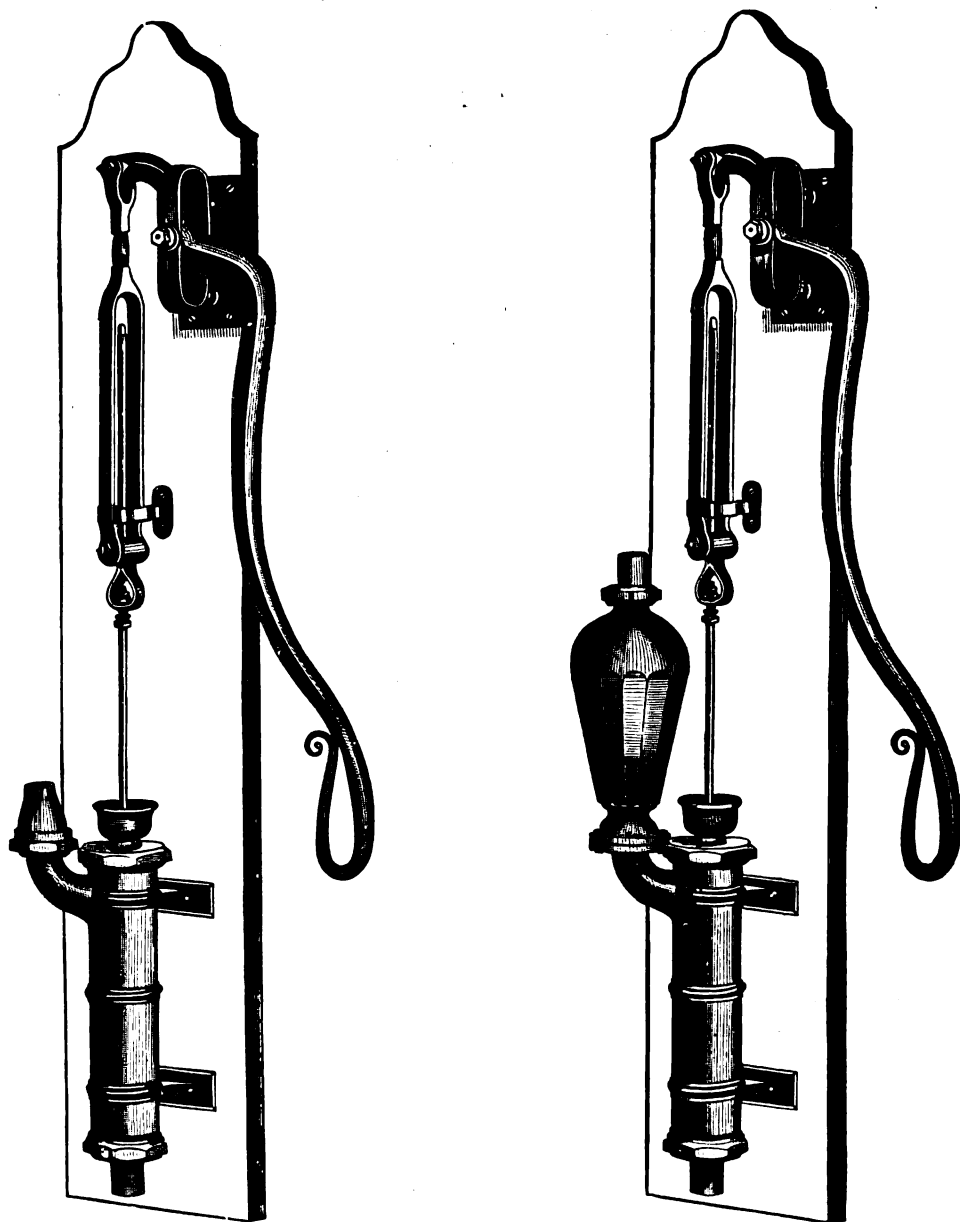
OUR Hydraulic Pressure Testing Pump is made exceedingly strong and compact, and designed especially for testing boilers, pipes, casks, etc.

The piston being small it is not designed for a lift pump, but for the purpose above described there is no better pump made.

One man can generate a pressure of one thousand pounds to the square inch. It should be placed near the water with one or two feet of suction; more than that is disadvantageous.

Iron, with $1\frac{1}{4}$ inch piston, 1 inch suction
and $\frac{3}{8}$ inch discharge pipe.....\$25.00
Brass..... 45.00

Hand Lever Force Pumps.



THESE Force Pumps are mounted on a plank of thoroughly seasoned lumber, and made in the most substantial manner. They are artistic in design, tastefully painted, and simple in action and construction. These Pumps are designed for drawing and forcing water to supply elevated places, and they can be furn-

ished with or without air chamber. The lever is strongly made with corresponding fulcrum bolt on which it works. The rods, stuffing box, raising main, nuts, etc., are all brass.

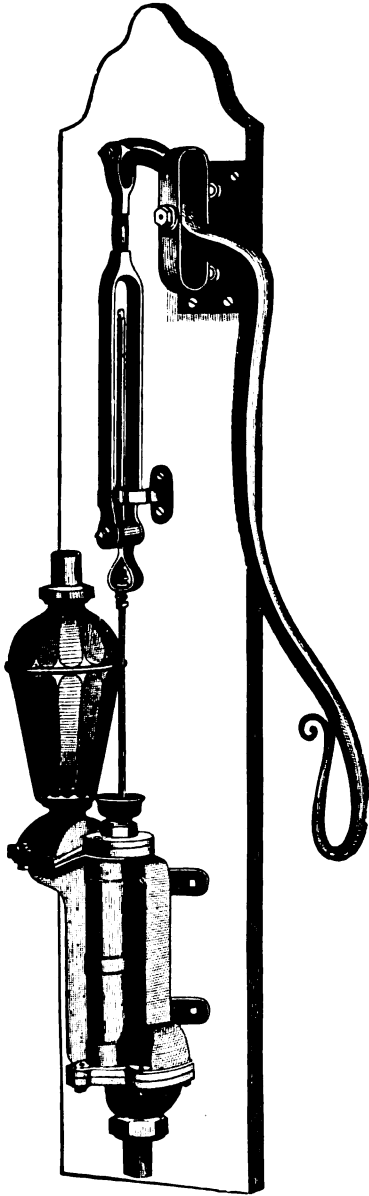
These Pumps are made right or left, for hot or cold water, and to fit lead or iron pipe as ordered.

WITH AIR CHAMBER.

| No. | Cylinder. | Gall. per Stroke. | Pipe. | Iron. | Brass Cyl. | All Brass. | Iron. | Brass Cyl. | Brass. |
|-----|-------------------|-------------------|-------------------|---------|------------|------------|---------|------------|---------|
| 1 | 2 inches. | $\frac{1}{8}$ | 1 inch. | \$14.00 | \$18.00 | \$26.00 | \$16.00 | \$21.00 | \$28.00 |
| 2 | 2 $\frac{1}{2}$ " | $\frac{1}{4}$ | 1 $\frac{1}{2}$ " | 15.00 | 20.00 | 30.00 | 17.00 | 23.00 | 32.00 |
| 3 | 3 " | $\frac{3}{8}$ | 1 $\frac{3}{4}$ " | 16.50 | 22.00 | 35.00 | 18.50 | 25.00 | 37.00 |

With Cock on side of Air Chamber, extra, \$5.00.

Double Acting Force Pump.



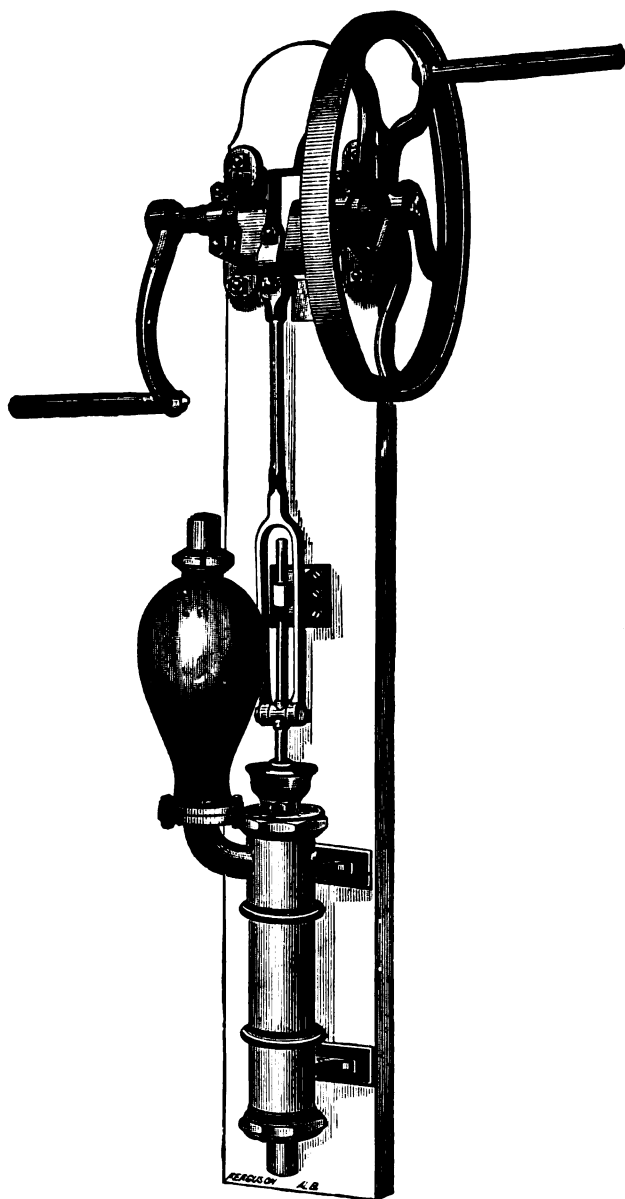
THIS Pump is a very useful and convenient one for many purposes, as it will force up twice the quantity of water at each stroke with but little more exertion than is required to operate a single-acting hand pump.

The water courses are large and direct, reducing the friction to a minimum, giving these pumps the highest possible economy of power and greatest efficiency.

They are made with or without air chambers, the air chamber having the opening at the top with a side cock below if required. There are six sizes made and three kinds as indicated in the following price list:

| DIMENSIONS. | | | IRON PUMP. | | | BRASS PUMP. | | | | |
|-----------------------|-----------------------|---------------------|----------------------|-------------------|-----------------------|----------------------|------------------------|------------------------|-------------------------|-------------------------|
| Diameter of Cylinder. | Capacity each Stroke. | Size of Water Pipe. | Without Air Chamber. | With Air Chamber. | Air Chamber and Cock. | Without Air Chamber. | With Iron Air Chamber. | Iron Chamber and Cock. | With Brass Air Chamber. | Brass Chamber and Cock. |
| Inches. | Gallons. | Inches. | | | | | | | | |
| 2 | 1-5 | 1 | \$13.50 | \$15.50 | \$18.00 | \$26.00 | \$28.00 | \$30.50 | \$38.00 | \$41.00 |
| 2½ | 1-3 | 1¼ | 17.00 | 19.00 | 21.50 | 38.00 | 40.00 | 42.50 | 50.00 | 51.00 |
| 3 | 1-2 | 1½ | 21.00 | 23.00 | 25.50 | 52.00 | 54.00 | 56.50 | 64.00 | 65.00 |
| 3½ | 8-4 | 2 | 25.00 | 28.50 | 31.00 | 69.50 | 73.00 | 75.50 | 98.00 | 95.00 |
| 4 | 7-8 | 2 | 37.00 | 42.00 | 45.00 | 94.00 | 98.00 | 101.00 | 118.00 | 120.00 |
| 4½ | 1 | 2 | 50.00 | 55.00 | 58.00 | 136.00 | 141.00 | 145.00 | 161.00 | 163.00 |

Fly-Wheel Force Pump.



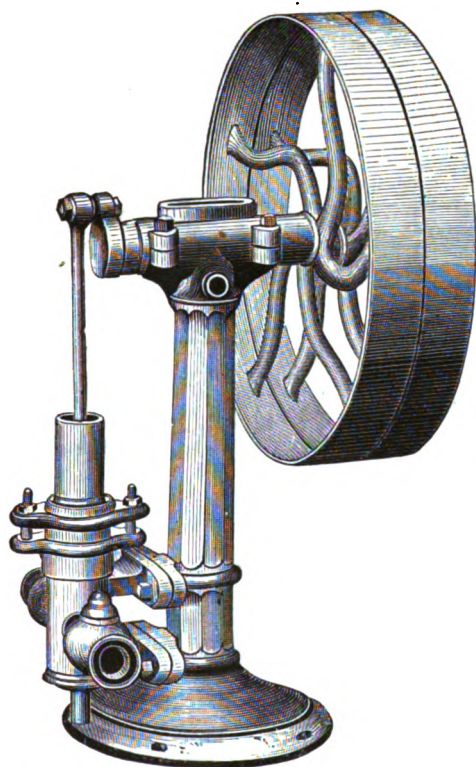
THE single acting Force Pump here illustrated is fitted to be worked by two cranks and fly-wheel, so that two or four men can operate it in case a high lift or great pressure is to be overcome.

We mount any of our single or double acting pumps in this way at prices corresponding with those given below.

The balance wheel has a two inch face on which a belt can be used from machine power, the wheel being varied in diameter according to the capacity of the pump.

| Diameter of Cylinder. | Capacity each Stroke. | Capacity Double Stroke. | Size of Water Pipe. | Single Acting Iron Pump. | Single Acting Brass Cylinder. | Double Acting Iron Pump. | Double Acting Brass Cylinder. |
|-----------------------|-----------------------|-------------------------|---------------------|--------------------------|-------------------------------|--------------------------|-------------------------------|
| Inches. | Gallons. | Gallons. | Inches. | Price. | Price. | Price. | Price. |
| 2 | $\frac{1}{2}$ | $\frac{1}{2}$ | 1 | \$36.00 | \$45.00 | \$39.00 | \$51.00 |
| 2 $\frac{1}{2}$ | $\frac{3}{4}$ | $\frac{3}{4}$ | 1 $\frac{1}{2}$ | 38.00 | 48.00 | 41.00 | 56.00 |
| 3 | 1 | 1 | 1 $\frac{3}{4}$ | 40.00 | 54.00 | 45.00 | 62.00 |

The Pulley Plunger Pump.



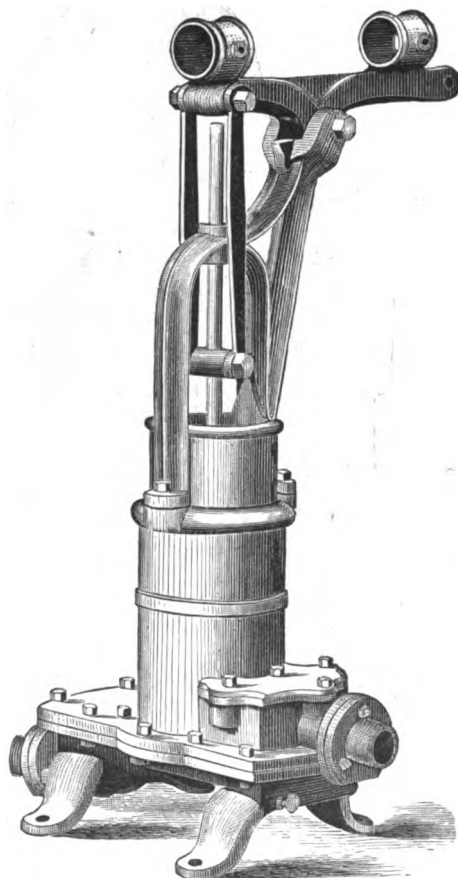
THIS cut represents a popular and excellent Boiler Feed, mounted on a strong iron column with a broad and substantial base and extra-long bearing for crank shaft; it is also useful for working hydraulic machinery of any kind. An outside bearing for the shaft (not shown in

cut) effectually prevents column and pump from being drawn out of line by the belt.

This Pump does not need a counter-shaft, but can be connected by belt directly from the fast and loose pulley to main shaft of engine.

| Diameter of Cylinder. | Stroke. | Capacity. | Revolution. | Pipe. | Diameter of Pulley. | Face of Pulley. |
|-----------------------|---------|-----------|-------------|-------|---------------------|-----------------|
| Inches. | Inches. | Gallons. | Per Min. | | | |
| 2 | 3 | 1-26 | 50 | 1 | 8 | 3 |
| 2½ | 3 | 1-16 | 50 | 1¼ | 8 | 3 |
| 3 | 3 | 1-10 | 45 | 1¼ | 8 | 3 |
| 2 | 6 | 1-13 | 40 | 1 | 22 | 4 |
| 2½ | 6 | 1-8 | 40 | 1¼ | 22 | 4 |
| 3 | 6 | 1-5 | 40 | 1¼ | 22 | 4 |

The Prairie Force Pump.



THIS well-known and popular Pump is remarkable for its simplicity and efficiency. The valves can be removed and replaced without disturbing the cylinder or pipes. Oil or water can be put in the extra cylinder on top to cover the stuffing box, and prevent air from gaining access on the downward stroke of the piston.

This pump is double acting, and is furnished

with wooden levers or with direct connections for crank and fly-wheel.

| Diameter of Cyl'r. | Single Stroke. | Capacity of Cylinder. | All Iron. | Brass Cylinder. |
|--------------------|----------------|-----------------------|-----------|-----------------|
| Inches. | Inches. | Gallons. | Price. | Price. |
| 3 | 8 | $\frac{1}{2}$ | \$55.00 | \$85.00 |
| 4 | 8 | $\frac{1}{2}$ | 65.00 | 80.00 |
| 5 | 8 | $1\frac{1}{2}$ | 80.00 | 100.00 |
| 6 | 8 | 2 | 100.00 | 125.00 |
| 3 | 14 | 1 | 65.00 | 80.00 |
| 4 | 14 | $1\frac{1}{2}$ | 90.00 | 115.00 |
| 5 | 14 | $2\frac{1}{2}$ | 120.00 | 155.00 |
| 6 | 14 | $3\frac{1}{2}$ | 165.00 | 210.00 |

Hand Fire Engine.

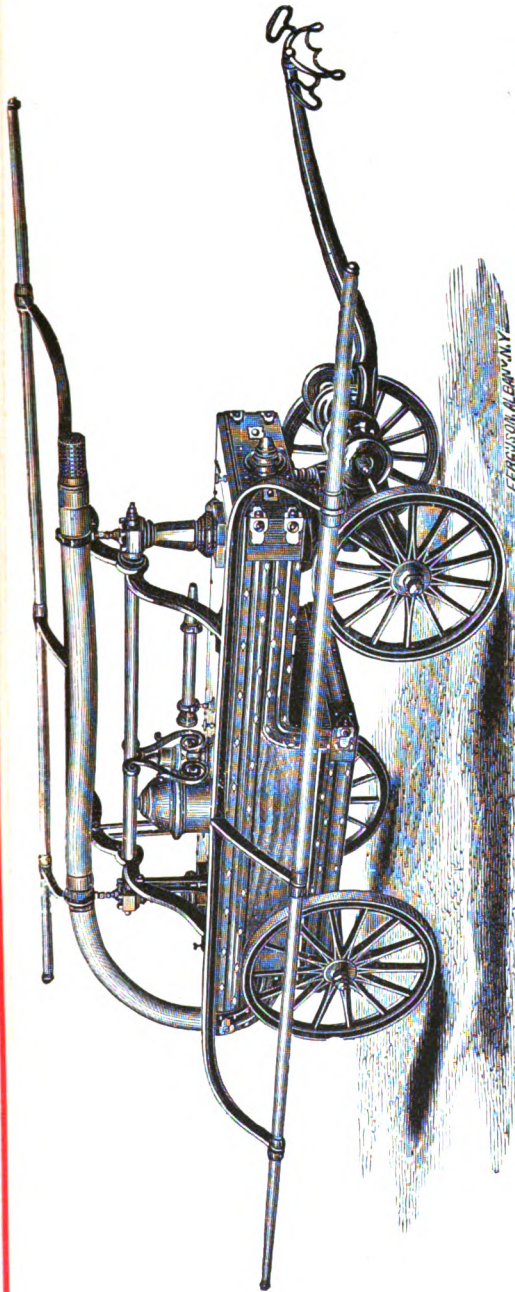
WE illustrate a Fire Engine especially designed for use in small towns and mining settlements. They are made either plain or with solid mahogany box, bound with brass corners and the working parts highly finished; also to throw one or two streams as required.

The cylinders are brass of 7 inches stroke, and the valves and valve seats are of gun-metal. The breaks are 16 feet long, wrought iron, and fold up. Wheels of the best seasoned timber, iron bound, 31 and 37 inches in diameter. It carries 12 feet of suction hose with an all-brass strainer, and has rope reel for drawing engine by hand. Brass discharge pipes, nozzles, wrenches, etc., complete and ready for use. These engines will throw a $\frac{3}{4}$ or $\frac{7}{8}$ inch stream about 140 feet. Their weight is 1,800 lbs.

We can also furnish a more elaborate design with square box and crane neck front, with wheels 44 and 49 inches in diameter; weight of engines from 2,200 to 2,500 lbs. Every machine is equipped with 2 discharge pipes, 6 assorted nozzles, 8 wrenches, 2 electro-plated signal lamps (colored glass with name of engine), reel and drag rope, and engine painted and lettered in any color and style desired.

These machines are built for strength, compactness and efficiency—qualities more useful than excessive weight and bulk in a hand fire engine.

- | | |
|--|-----------|
| No. 1. Plain, 6 $\frac{1}{2}$ inch cylinder, one 2 inch discharge hose, 12 feet of 3 inch suction hose..... | \$ 650.00 |
| No. 2. Plain, 7 inch cylinder, two 2 inch discharges, 12 feet of 3 $\frac{1}{2}$ inch suction hose..... | 725.00 |
| No. 3. Mahogany, 6 $\frac{1}{2}$ inch cylinder, one 2 inch discharge, 12 feet of 3 inch suction hose..... | 950.00 |
| No. 4. Mahogany, 7 inch cylinder, two 2 inch discharges, 12 feet of 3 $\frac{1}{2}$ inch suction hose..... | 1,050.00 |
| No. 5. Crane Neck, 6 $\frac{1}{2}$ inch cylinder, one 2 inch discharge, 12 feet of 3 inch suction hose..... | 1,400.00 |
| No. 6. Crane Neck, 7 inch cylinder, two 2 inch discharges, 12 feet of 3 $\frac{1}{2}$ inch suction hose..... | 1,500.00 |
| No. 7. Crane Neck, 8 $\frac{1}{2}$ inch cylinder, two 2 $\frac{1}{2}$ inch discharges, 16 feet of 4 inch suction hose..... | 1,800.00 |



Locomotives.

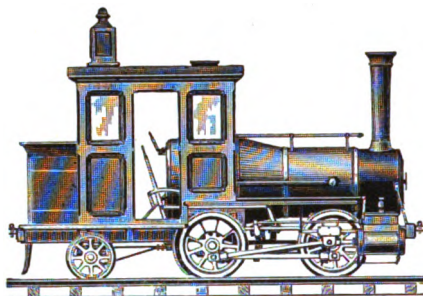


Fig. 1.

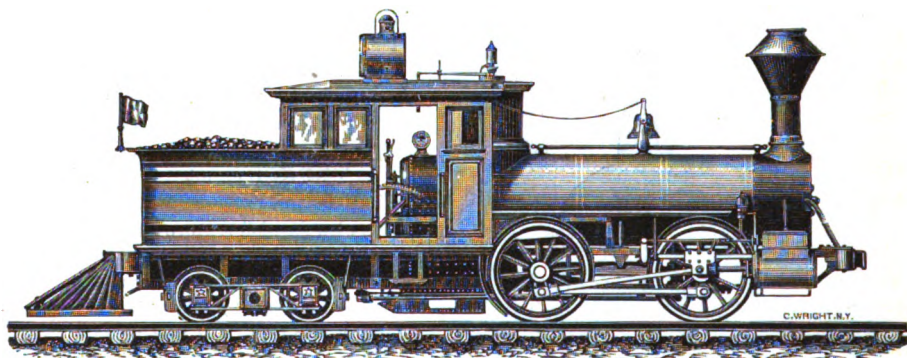


Fig. 2.

LIGHT railroads, constructed for special purposes and operated by steam power, are coming into use more and more every year in mining regions, on sugar estates, or places where there is a light traffic of either passengers or freight. Such roads can be made of any gauge from 2 feet to 4 feet, $8\frac{1}{2}$ inches, or even wider, and can be employed with great profit. In an open country, and for the transportation of both passengers and freight, there is little or no advantage in making the gauge narrower than 4 feet, $8\frac{1}{2}$ inches; but for carrying minerals or agricultural products, and especially for mines, the narrower gauge is sometimes preferable.

The character and cost of such roads is dependent upon the nature of the traffic. They may be laid with rails weighing from fifteen pounds per yard, upward. For such roads we are prepared to build light tank locomotives of the system designed by Mr. M. N. Forney, of which we give illustrations, as above.

"These engines utilize the whole weight of the boiler and machinery, which is permanent, for producing adhesion, while the weight of the water and fuel, which is variable, is carried on a truck. The dead or non-adhesive weight is thus less than that of ordinary locomotives of the same capacity. The length of wheel-

base is sufficient to give the requisite steadiness, and is flexible enough for running through any practicable curves. Eighty of these engines are now at work on the New York Elevated Railroads. Locomotives of this plan are adapted to any kind of traffic, freight, passenger or switching, wide or narrow gauge roads, and can be made of any weight up to fifty tons or even more. Engines of this kind of equal capacity are more simple, have fewer parts, and cost less than locomotives of the usual plan."

Fig. 1 represents a plan of such a locomotive with a truck having a pair of single wheels only. This answers very well for slow speeds, and when a small supply of water and fuel is required. For higher speeds a four-wheel truck, like that shown in Fig. 2, is recommended.

Such engines can be made to burn hard or soft coal, or wood, as required. Their cost depends of course on their size and weight. The same is true of the entire cost of railroads. It is said that light roads, for the transportation of freight and passengers, may be built and equipped for as little as \$5,000 per mile; but before any estimates can be made which will be trustworthy, the locality in which they are to be built, the nature of the country, character of the traffic, speed, grades, curves, etc., must be known.

The Portable Steam Hammer.

THE advantage to be gained by using Steam Hammers are obvious, not only in the large amount of labor performed in a given time, and the consequent reduction of cost, but also in the superior excellence and perfection of the work produced. By their use also, large quantities of otherwise waste material may be worked up and utilized. They would long since have been introduced into the smaller (as they have been into the larger) smith shops, had it not been for the cost of the machines hitherto offered to the public.

In offering our Hammer, we feel confident that we have successfully met the wants so long felt by manufacturers, viz.: that of a cheap Steam Hammer, simple in construction, easily managed—even by unskilled workmen—efficient in the performance of the work required, and not liable to get out of order.

Our Hammers do not need a ponderous iron frame, but are constructed so as to be readily bolted on any ordinary upright post in the smith shop; although when it is desired, we can supply iron frames.

The Hammers are adapted to all kinds of general and special forging work. They are made of the very best material. The piston and rod are of steel. The die head is also of steel. We make the rod square, which enables us to pack it better and with less friction, than is possible with any other shape.

We are manufacturing at present three sizes, as follows:

No. 1, capable of forging and working iron from three inches round or square, down.

Diam. of cyl'der, 5 in.; length of stroke, 10 in.

Price, without Anvil\$275.00
 " with " 355.00

No. 2, capable of forging and working iron from five inches round or square, down.

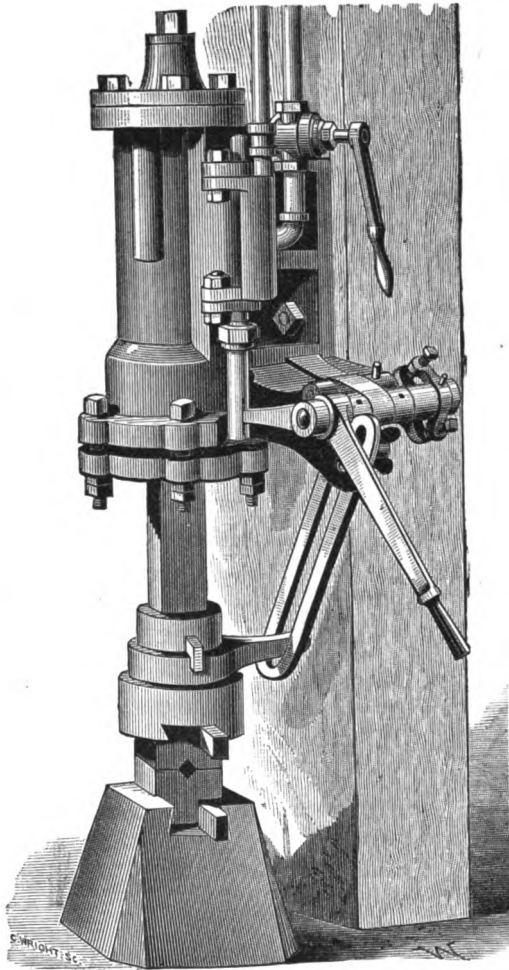
Diam. of cyl'der, 5½ in.; length of stroke, 16 in.

Price, without Anvil\$325.00
 " with " 450.00

No. 3, capable of forging and working iron from eight inches round or square, down.

Diam. of cyl'der, 6½ in.; length of stroke, 24 in.

Price, without Anvil\$400.00
 " with " 575.00



Would recommend size of wooden post for

No. 1 Hammer, 10 x 10 inches, yellow pine,

No. 2 " 10 x 10 " " "

No. 3 " 12 x 12 " " "

when new post is put in for same.

Full directions for setting Hammer and Anvil will be sent with each Hammer.

A great number of these Hammers are now in use and are giving excellent satisfaction.

We are prepared to estimate on Hammers for special work.

RIBON & MARCH,
JERSEY CITY, N. J.
U. S. A.

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